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Fighting Equipment

OUR belief in the value of combined air exercises and (particularly) of healthy competition, no matter in what connection, has been expressed on several recent occasions in this column. Exercise *Foil*, now completed, provided many opportunities for matching defence against attack under near-operational conditions and, quite apart from the human element, there were many exceptional opportunities for judging the efficiency of the aircraft involved. Following the much-discussed and seemingly inconclusive B-36-versus-jets controversy in America, instances of high-altitude interception during *Foil* were of predominant interest. Sheer speed, for example, was seen in its relationship to climb, controllability and duration.

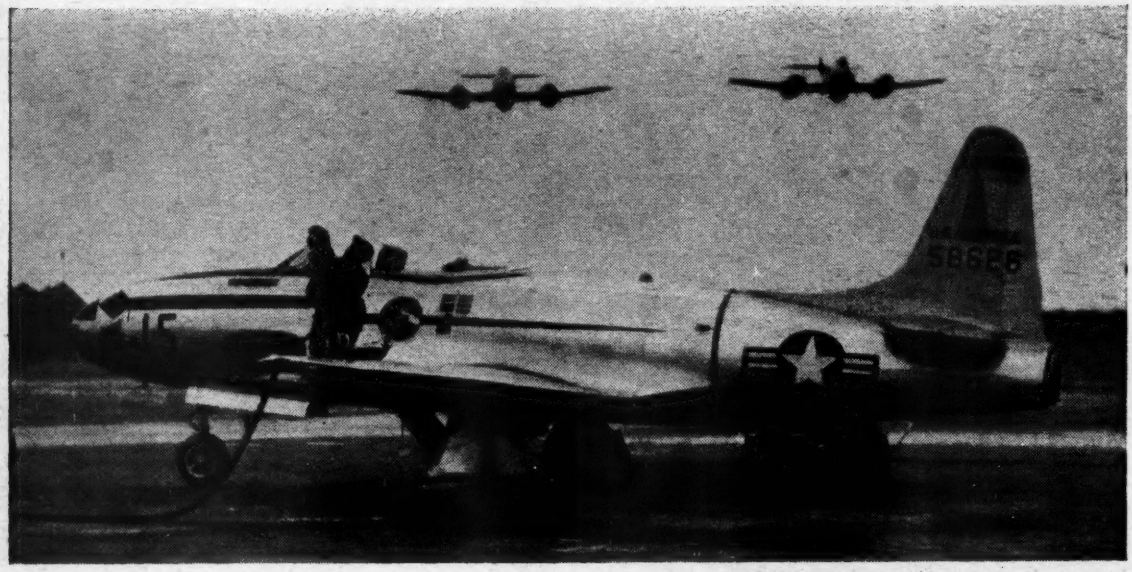
The true operational value of the aircraft now used by our squadrons tends on occasions to become overshadowed by an isolated outstanding performance of a British or, more often, American prototype. Provided that certain minimum figures for climb and speed can be achieved by operational fighters, for example, good handling characteristics at altitude, short take-off and simplicity of maintenance are qualities which then begin to demand equally high priority. All the current marks of British jet fighters are practical, well-tried machines, exhibiting a very creditable balance of performance; it may be added, incidentally, that more than one observer has been re-impressed during the latest exercises by the excellent showing made by the perennial Spitfire—still in first-line operation—at altitudes above 30,000 feet.

At the risk of restating the obvious, it should not be overlooked that aircraft in squadron service must be expected to compare unfavourably in many respects with the prototypes which may succeed them. Many months must elapse between first flight and acceptance, and between production order and equipment of squadrons. Acceptance of one or, perhaps, two, military designs for production (and few countries can afford the cost of more) is always something of a gamble and a compromise—a gamble on the exact role the aircraft may have to fulfil, on the quality of the enemy and, more especially, on the time of greatest emergency and a compromise between the many conflicting features of performance and equipment. There is little value in having a fighter which can climb to intercept a bomber force at 35,000ft and has speed enough to close in but stalls out of a $\frac{1}{2}g$ turn every time it manœuvres for the kill. Even the best jet intercepters lack the fuel capacity to make more than a pass or two following interception at the very high levels. Thus, heavy fire power and accurate shooting are demanded.

The Bomber Aspect

What has been said of fighter performance and production is even more true of the bomber. Where and what will be its targets, when should it be ready for service, and what defences must it be able to penetrate? In this country we have gambled or, we believe, guessed rightly, on these difficult questions, and secret bomber prototypes are now beginning to take shape for use in perhaps five or ten years' time. The expense in men, money and materials which the provision of interim types would have involved could not have been justified here. Those who believe, however, that our present lack of a modern heavy bomber indicates a wish that America should look after all bomber operations for Western Union, are very wide of the mark indeed.

It is a sobering thought in these days of atomic bombing that our fighter defence-force might be rendered almost powerless by an enemy which made full use of bad weather and darkness to conceal large numbers of small high-speed stabbing raids. Current single-seat jet aircraft are unequipped for blind attack and, moreover, lack the additional aids or endurance to be landed rapidly and in adequate numbers during conditions of low visibility. Development of aids to overcome these weaknesses, together with the two-seater aircraft required to carry them, has become a vital need. In the matter of all-weather fighters, comparatively large and carrying a crew of two, we ought to follow the lead given by America—and start following now.



"FOIL" COMPLETED

Pattern of Activity in Phases II and III : Accounts by "Flight" Staff in the Air and on the Ground

Illustrated by "Flight" photographs

At the Fighter Command H.Q. conference which opened Exercise "Foil" are (left to right) Air Marshal Sir Aubrey Ellwood, the A.O.C.-in-C. Bomber Command, Lt.-Gen. Sir Ivor Thomas, G.O.C.-in-C. Anti-Aircraft Command, and Air Marshal Sir Basil Embry, A.O.C.-in-C. Fighter Command. Symbolic of R.A.F.-U.S.A.F. co-operation is the scene above, where 12-Group Meteors fly over one of the visiting F-80s at Horsham St. Faith.

IN our narrative of the opening phase of Exercise *Foil* last week, we emphasized that the design of the operation had a fighter bias, the cardinal purpose having been to exercise and refine the air defence system of Great Britain. Now that the second and third phases are over—the Exercise ended at dusk last Sunday—it can justifiably be concluded that a good deal, of fundamental importance, has been learned.

Naturally enough, the full scale of benefit will not be assessable until all the records, logs, reports and tactical analyses have been fully resolved; nevertheless, there is immediate reward in having given the Auxiliaries and Territorials a refreshing breath of operational air. In this context, of course, there is some pertinence to Regular personnel, for there are many R.A.F. and Army people who have joined since 1945 (aside from National Service entry) and thus have no experience of wartime work.

Phase II started on Tuesday morning (June 28th), the first strong attack being made by 20 Wellingtons which entered the area near Yarmouth at 16,000ft and curved over London before flying out over Kent. Five 12 Group Meteor and Vampire squadrons engaged the Wellingtons at different times and, naturally enough, claimed mauling successes.

To give some realism to high-altitude, high-speed interception, Air Marshal Sir Basil Embry co-operated with Air Marshal Sir Aubrey Ellwood in seconding a squadron of Vampires to the attacking side to simulate a high-level formation of jet bombers. The Vampires made an attack on a target near Bath at 35,000ft. Continuing experimentation, the A.O.C. in C. Fighter Command sent in two Meteor squadrons and the Dutch Meteor squadron, operating as a fighter wing, to attack the Vampires. This resulted in claims of successful interceptions and combats. At the same time (1445 hours) six Meteors intercepted and attacked eight B-29s of the U.S. Third Air Division at 25,000ft over North London.

Three Superforts were also attacked at 1645 by a Meteor squadron at 30,000ft above Dover and, some little while later, other B-29s were engaged at 26,000 and 30,000ft over the North Sea. Then, at 1830, a second Vampire high-level bombing attack was launched. The four Vampires crossed over Yarmouth at 29,000ft, aiming for Coventry, but were successfully intercepted by a pair of Meteors from Horsham St. Faith; 10 minutes later, the Meteors also attacked a couple of B-29s 10 miles north of Cromer at the same height. The third Vampire high-level incursion was opposed by six Netherlands Meteors—one for each Vampire—at 20,000ft over Bury St. Edmunds.

During the night, the main attack was focused on Derby, when simulated T.I.s were lit at the Rolls-Royce works, with the Marker Force Mosquitoes leading a main force of Lincolns. The raid was conducted at between 15,000 and 20,000ft and continuous attacks were made by night fighters. The second heavy raid of the night was on London when, soon after midnight, 20 Lancasters and a medium force of Mosquitoes attacked the Battersea Power Station from between 17,000 and 20,000ft. Night fighters again intercepted and attacked over the whole approach and departure route.

On Wednesday, the 29th, enemy formations were detected concentrating in the Flushing area, and moving towards the Thames Estuary. They turned out to be about 30 Wellingtons at 17,000ft which, although intercepted by Meteors and Vampires, penetrated to attack Birmingham from about 10,000ft soon after mid-day. The attacking force's tactics for deceiving and dividing Fighter Command's resources then became apparent, for simultaneous attacks were made by Ansons on Derby and by Mosquitoes on Coventry; the latter raid was intercepted by the Dutch Meteors. In the afternoon B-29s came in at 25,000ft shortly after 1400 hr, aiming at Northolt, and, a little later, another force of Superforts were plotted heading for Lincoln to attack Sheffield.

Assorted Attacks

At approximately the same time, other B-29s crossed the coast near Cromer to attack London, whilst later on still more B-29s crossed Lowestoft at 25,000ft for a raid on Derby. In all of these raids the intruders were strongly and consistently attacked, the last-mentioned raid on Derby being made after a running battle with a wing of Meteors and U.S. 36th Fighter Group F-80s from Horsham St. Faith. Apart from this high-level activity, a large number of Hornets made low-level attacks in pairs or in small formations on airfields and radar installations during the whole daylight period and, of these, too, claims by Meteors and Vampires for successful interceptions were made.

Night operations started with a small high-level attack by B.A.F.O. Mosquitoes on airfields in Kent, Essex and Hampshire, in poor visibility. Just before midnight, a strong force of Lincolns and Lancasters, with Mosquitoes acting as markers, crossed the coast at Grimsby between 15,000 and 18,000ft, heading towards Sheffield. They turned, however, towards Birmingham, crossing over Derby *en route*, to deliver their attack on the B.S.A. works from 20,000ft at about 0010 hr. This attack, one of the heaviest of the Exercise up to that time, lasted 25 minutes, and night fighters were extremely busy the whole time.

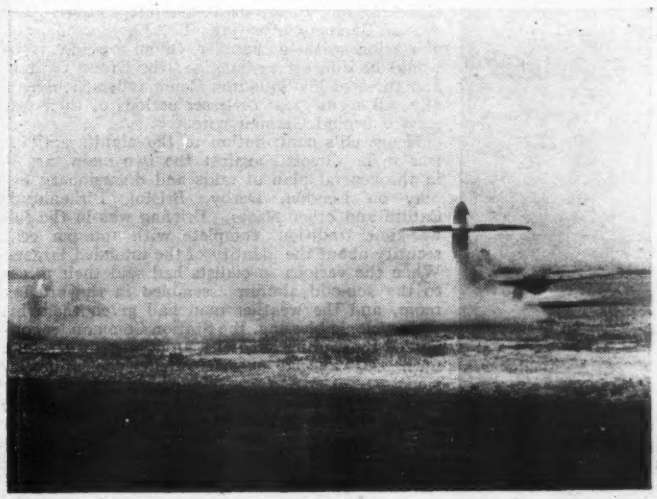
A short while before this main attack, a small force of Mosquitoes made a diversionary raid on Coventry, and a feint raid on London was carried out by a medium force of Lancasters which came in from the North Sea at 18,000ft at 0025 hr. Low stratus approached the East Anglian airfields at dusk, causing fog in most of the southern area of the Exercise, and for this reason no operations were carried out during the night in 11 Group area. Thus, all the night-fighter activity was in 12 Group, but the weather deteriorated to such a degree that the night fighters were recalled soon after 0100. A.A. Command guns, however, were busy and claimed two certain "kills" on the aircraft attacking Birmingham between 10,000 and 19,000ft.

Fighter Command's servicing personnel, as well as the pilots, found the exercise a hectic, but welcome, break from routine. In the interval between scrambles, Meteors are seen receiving attention.

Thursday, June 30th, saw Vampires again withdrawn from Fighter Command to act as jet bombers, but this time at low level. Just before reaching their radar-installation target in Norfolk, however, they were intercepted by four Meteors and F-80s. The consequence of this was a running battle all over Norfolk, leading the Vampires to run out of fuel so that they had to land at Horsham St. Faith. After a short time in "captivity," however, the raiders were refuelled and returned to base.

At 1135, a P.R. Spitfire was intercepted at 38,000ft by Meteors off the coast near Cromer, and report has it that the Spitfire was by no means easily subdued—a pointed indication of the importance of low span-loading at great height.

In the afternoon, a force of about 30 Wellingtons crossed near Yarmouth to fly over Norwich, Peterborough and Rugby before turning towards London. They passed over the capital at 1345, flying at 17,000ft, to attack an oil refinery in the Docks area, being subjected the whole time to running combats with



The continued dry weather and blast from jets played havoc with the fighter airfields. Every scramble entailed a duststorm.

"Foil" Completed . . . . .

seven squadrons of fighters, including the Thorney Island wing of R.A.F. and Dutch Meteors. Six Meteor squadrons, operating in two wings, also engaged a medium formation of B-29s making an attack on London at between 30,000 and 35,000ft.

Two other raids were made on the oil refinery in the London Docks, the first of which was by a medium force of Hornets, which exchanged their usual rôle of low-level marauders for that of high-flying bombers and, although heavily engaged by a Meteor squadron at 20,000ft, pressed home their attack. The final raid on the oil refinery was made by a considerable force of Lancasters, which was intercepted well before it approached the coast by both R.A.F. and Netherlands Meteors and, subsequently, by other Meteor squadrons overland.

More B-29s came in over the Thames Estuary at 24,000ft in the late afternoon to make an internecine attack on their own H.Q. at Ruislip. Long before they reached the target, however, they were attacked, first by three, and later by two more, squadrons of Meteors. The Superforts also raided Derby during the afternoon and Sheffield in the evening, whilst Meteors and F-80s conducted interceptions.

B.A.F.O Mosquitoes were laid on as a high-level bomber formation to attack the B.S.A. works at Birmingham whilst, at the same time (1730), the Rolls-Royce works at Derby and the Vickers steel works at Sheffield were hit by Mosquitoes of Flying Training Command. This concluded Phase II.

In this phase, the control and reporting staffs were enabled to attain valuable practice in the operation of large fighter formations deployed against the increasingly heavy attacks requested of Bomber Command. The use of Vampires and Hornets at high level, to say nothing of the B-29s, offered first-class opportunities for showing the re-design inevitable in fighter tactics at high altitudes, and, of course, the slower raids made by Wellingtons and Ansons had been of great use in helping to brace up comparatively untrained personnel after their preliminary "blooding" during Phase I.

At 0700 on Saturday, July 2nd, Phase III of the Exercises started with the Auxiliary squadrons, Royal Observer Corps and Territorial Anti-Aircraft units back in harness again. Transport Command co-operated by laying on three Dakotas and a couple of Ansons to "lift" Auxiliary personnel from Hooton Park (610), Wood Vale (613) and Llandow (614) down to their Exercise stations.

The first attacks started when Hornets in pairs attacked six airfields and radar stations between Yorkshire and the South Coast a little before 0830 hours, this being followed by an attack on Sheffield by a small force of Ansons at 0910, another force of Ansons making an attack on Leeds some ten minutes later. Then at 1000 hours a small force of Mosquitoes attacked Birmingham at medium level.

The Auxiliary squadrons were engaged in opposing strength when Nos. 600, 601, 604, 608, 610, 613 and 615 were operated as a single large wing which, from a rendezvous over Cap Gris Nez, came in to attack London at about 22,000ft. This formidable onslaught was intercepted by R.Aux.A.F. Vampires (501) and Meteors (500) over the Thames.

During the early afternoon B-29s made high-level attacks on London and Birmingham and twice on Liverpool, whilst Wellingtons assailed Birkenhead and Newport, Mon., the various targets being the B.S A. works at Birmingham, Vickers works at Sheffield, an armament factory in Leeds, and the docks and railway junctions at Newport. Whilst Regular Meteors and Vampires contributed to the interception of these several raids the greater part was left to the Auxiliary squadrons, 12 squadrons in 11 Group area being scrambled.

The largest force of bombers to be mounted in the Exercise made a compound raid close behind Marker Force Mosquitoes, first on the Royal Victoria Dock, London, at 0115, thence proceeding north and splitting into two separate forces. One of these attacked Rolls-Royce, Derby, just before 0200, whilst the other attacked the Albion Motor Works at Leeds 20 minutes later. At all three target points simulated T.I. flares were lighted. Subsidiary targets for smaller forces of Mosquitoes and Wellingtons were Bristol, Birkenhead and Barry docks, all of which, as for the main force targets, were vigorously defended by night fighters. The latter were also called upon to intercept Mosquito intrusions at their own airfields.

On Sunday, July 3rd, low-level intruder attacks were made over Kent, Essex and Suffolk quite early on, against which Meteor pilots reported successful combats. At 0930 a medium force of Wellingtons crossed Nottingham at between 11,000 and 15,000ft to attack Manchester, being intercepted over the coast and throughout the whole penetration by Meteors, Vampires and Auxiliary squadron Spitfires.

Very shortly afterwards another force of Wellingtons, after approaching London from the north and being engaged by 501, 601 and 608 Spitfire squadrons and by R.A.F. and Dutch Meteors, turned west to make an attack on Cardiff. At about the same time a third force of Wellingtons was plotted out to sea, thence coming in over the coast at 15,000ft to attack London shortly after 0935. Meteors made continued interceptions of this force.

Mosquitoes made a medium-level attack on Birkenhead whilst Hornets were used in pairs for low-level strafing attacks on airfields and radar installations, these attacks being supplemented by a dozen Mosquitoes. Another small force of Mosquitoes made a swoop on a night-fighter base in East Anglia and, conforming to the pattern held throughout the Exercise, the combat reports of fighter pilots claimed numerous successful interceptions.

In the magnificent Sunday afternoon weather the Superfort raid at about 20,000ft on the 11 Group Headquarters at Uxbridge must have been witnessed by thousands of people in the London area and, tracing delicate contrail patterns over the vault of sky, brought the last phase of the Exercise to a picturesque conclusion.

C. B. B.-W.

All genned-up: a glimpse of the Hemswell briefing. Courses are visible on the map. Note, on the right, the silhouettes of "enemy" fighters.

LINCOLN NIGHT-OUT

ON Saturday night a member of the staff of *Flight* had the pleasure of a front seat for *Foil* as a guest at Hemswell, who were operating three Lincoln squadrons at maximum effort. The Station Commander is G/C. T. A. B. Parselle, and a station with a happier, more-top-line spirit would be difficult to imagine; the Group Captain and three of his Squadron Commanders, incidentally, all spent great or lesser periods of their war service behind German wire.

Hemswell's contribution to the night's activity was to be directed against the two main targets in the general plan of raids and diversionary by-play on London, Derby, Bristol, Birkenhead, Cardiff and other places. Briefing was in the full war-time tradition, complete with 100 per cent security about the identity of the intended targets. When the various specialists had said their pieces to the 200-odd aircrew assembled in the briefing room, and the weather man had given them his anti-cyclonic blessing, the Station Commander concluded by reading out (with an admirably straight face) this alleged special intelligence appreciation:—

"Enemy broadcasts, and extracts from his

"Foil" Completed . . . . .

National Press, indicate that his morale is low. Loss of sleep by round-the-clock bombing is causing serious loss of output. It is expected that a day or two of our maximum effort may result in his seeking terms for an armistice."

We flew in D-Dog (Captain, F/L. R. B. Phillips, D.F.C.), a much-travelled Lincoln which has been on good will and training flights to South America (1946), North America ('47), Singapore ('48), Egypt and elsewhere. She bears the name *Raja Awan* as a legacy of the Far-East trip.

With 2,800 gallons of fuel, we were flying at an a.u.w. of 70,973 lb. The flight-plan provided, first of all, for an eastward leg to a point off the Frisian Islands. Airborne at 2142 hr, we crossed the coast at Skegness, the Lincolns flying in a loose gaggle at 2,700ft, with their navigation lights swinging star-like among the East Coast light-vessels; it was a view we were able to enjoy by courtesy of the flight engineer, who, having fulfilled his take-off commitments, surrendered his seat alongside the Captain and descended to the roomy nose-position.

With the four Packard-Merlin 68A engines spinning contentedly at 2,000 r.p.m. and autopilot "in," it was a soothing ride in airline comfort to the first turning-point; then, as we approached the Dutch coast, with the airport beacons of a glowing Amsterdam winking from the starboard beam, the Captain increased revs to 2,700 and we started a leisurely weak-mixture climb of 400-500ft/min at 140 kt towards operational height. At 2355 hr, having made two legs down through Holland, the aircraft was levelled-off at 20,500ft and set on a course of 272 deg for a straight run-in to the Thames Estuary for Target No. 1—the lock gates of the Royal Albert Dock, London.

With heating on, the cockpit was so warm that overalls, Mae West, harness and flying-boots were an incubus, and an oxygen-mask a penance. As the glare of Rotterdam crawled slowly under the starboard wing the flight engineer got busy among a heap of parcels reminiscent of Mount Pleasant sorting-office, tearing the wrappers from prodigious supplies of *Window* and ejecting their contents earthward through a chute; it was a labour from which both he and the bomb-aimer, who presently came forward to take up his nose-position, were to have practically no respite for the next two hours.

Too Much Light

So good was the visibility that the lights of the English coast were discernible 100 miles ahead, and the patch of pale greeny-blue light which at this time of year persists on the north-west horizon throughout the night was obviously going to help the defending fighters. There was, too, a first-quarter moon.

"Black-out," ordered the Captain, and the curtains were drawn round the navigator's and radio operator's cheerfully lighted desks. Nothing, of course, could be done about the pink-and-mauve wildfire that flickered from the unmuffled exhaust stubs of the Merlins, or the occasional bright carbon-sparks dancing back over the wings.

A little early—our time-over-target was 0116—we stood-off in a circuit, and simultaneously the opposition began to make its presence known. The intercom became filled with the usual farrago of very loud and somewhat excited "natter" inseparable from such occasions. Tail and mid-upper reported Mosquitoes and then cancelled them as other Lincolns. Identifying himself by the prefix Bedstead, the master-bomber educated us in crisp, crackling phrases from his Mosquito flying 12,000ft below, warning us to ignore the selection of decoy target-indicators invitingly displayed by the mendacious English, orders which we obediently acknowledged with a brief "Roger." ("Don't waste Bedstead's time with useless natter—he's got a lot of work to do," the signals officer had said at briefing.)

A very definite Mosquito made a pass at us from the port quarter, upper, and broke away starboard down. Our gunners opened a doubtless withering fire at 200yds with the signalling lights fitted in the flash-eliminators of their guns, but for some reason the fighter did not flash his navigation lights by way of return fire. (Interception reports, from both sides, identified by code flashes and carefully timed log-entries, are subsequently sifted and subjected to a process of Boffinization which ultimately permits accurate assessment of results to be made.)

Becoming the obedient subordinate of the two enthusiasts aft, D-Dog's Captain put her into what is perhaps a little extravagantly described as a "corkscrew, port," but which is

Raiding party : D-Dog and her crew, plus supernumerary.

nevertheless a most remarkable evolution to one (like the present writer) brought up with the somewhat Victorian convention that very big aircraft with lots of engines normally stay approximately horizontal and don't stand vertically first on one wing-tip and then on the other.

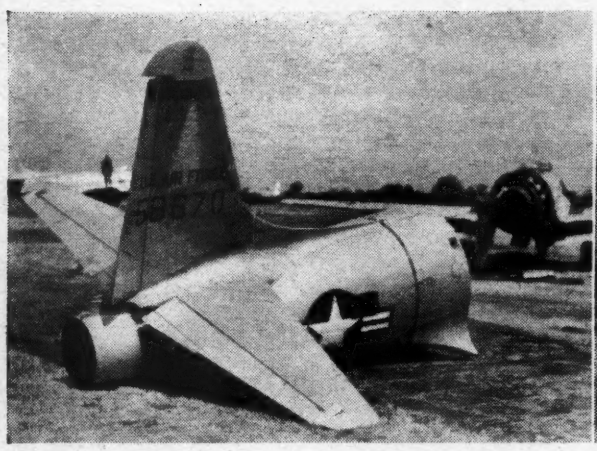
It was shortly afterwards that we picked up the triangle of three red T.I.s—glittering and smoking most pyrotechnically—that marked the true target, and ran-in level at 150 I.A.S. to do what was required of us. The camera indicator light glowed in the nose-position, and duty (or the first half of it) was done.

The Metropolis, looking even at this small hour like an inverted Milky Way strung with mercury-vapour necklaces, crept below the leading edge; the great main runway of London Airport slipped after it, a tiny rectangle outlined in lights (we were still at over 20,000ft); a turn on to 310 deg, and another airport, presumably Bovingdon, passed to starboard, its approach-beam squeaking briefly in the earphones as we crossed it at right-angles.

A further course-alteration, on to 329 deg, brought us, at 0145 hr, on to the approach to the second target, the Rolls-Royce works at Derby, due for demolition at 0155. Over the Midlands, the night's first cloud formed to a density of about 5/10 perhaps 10,000ft below, then cleared to reveal two unmistakable clusters of sodium-lights that were the indicators. They were duly photographed, the whole proceeding being a much more peaceful affair, and much less complicated by fighters, real and imaginary, than the London target had been. Possibly the Birkenhead diversionary attack had drawn them off; but this is pure conjecture, and only the operational H.Q. staffs, poring over their busy plotting-tables, can have known the real answer.

And now D-Dog was headed eastward, where first light was staining bands of smoky colour along the horizon. We saw what we thought was a flaming yellow T.I. until somebody remembered the blast-furnaces of Scunthorpe. We saw the Pundit beacon of our station winking invitingly to the southward, visualized bacon-and-eggs, and then resigned ourselves to the operational plan, which called for another hour's flying out over the North Sea, just to remind us that this was War (or something like it) and that home bases seldom lie within 20 minutes of heavy-bomber targets. The general opinion was that this overtime seemed a little uncalled-for in view of the fact that *Foil* was primarily a defensive exercise, with the bomber boys playing stooge.

"Foiled again," remarked the Captain, handing D-Dog over to the ministrations of the autopilot. At 0250 hr we started a gentle shedding of height, still on "George," and sliding down through unusual formations of castellated alto-cumulus. A series of dog-legs over the sea—during which the coastwise



Apparently the result of low-level strafing by a Hornet, this F-80's dismembered appearance is actually due to a simple servicing operation. Loosening of three bolts permits removal of the rear fuselage, and gives access to the 4,000 lb-thrust Allison J-33 turbojet.

"Foil" Completed . . . . .

lights of Holland were seen for the second time that night—eventually brought us back to base at 0310 hr and, in the growing light, a first good view of the other Hemswell Lincolns as they made their circuits. D-Dog seemed less anxious to be back than was her crew, for on the approach the port inner kept motoring regardless, and the Captain had to work quite hard to get the wheels into contact with the runway.

And so (via a brief but thorough interrogation, with appropriate cynicisms from both sides of the table) to the ultimate materialization of real instead of visionary bacon-and-eggs.

R. E. C.

BACKGROUND TO THE SCRAMBLES

EVEN as we awkwardly extricated ourselves from "official transport" at the main gate of Horsham St. Faith, near Norwich, the hoarse, unmistakable roar of a scrambling Meteor filled the station and the sky around it. Formalities fulfilled, we climbed the "tower" a few minutes later and saw with satisfaction that, following this operational overture, all the viligance and vitality that make up the atmosphere of a fighter base were in evidence and were likely to persist.

At their own distant dispersal point a group of F-80B Shooting Stars of the U.S. Air Force gleamed in scarlet and burnished silver; below the control tower, spaced in pairs round the beginning of the runway, were six Meteors, ready to start up and begin to roll within seconds. For *Foil* purposes, Horsham's operational strength then consisted of two well-known Meteor squadrons and ten F-80s of the 22nd (U.S.) Fighter Squadron, which flew in from Fuestenfeldbruck on June 20th. Adding, however, to the picture, if not to the power, were Spitfires of No. 504 (County of Nottingham) Auxiliary Squadron, adhering unbelligerently to their summer training programme; and target-towing Beaufighters and a Martinet.

Barely had the scene been observed when action began. A Very signal cracked and two F-80Bs whistled obediently down the perimeter track. Painted boldly on their noses were the names *Torchy* (this illustrated with a suitable "flame") and *Baldy*. As they swung smoothly on to the runway, a Hornet suddenly materialized from seven o'clock, put in (presumably) a burst of camera-fire, and flew over the jet fighters low enough, but too fast, to read the labels. Stung, the F-80s fumed away in pursuit of the fast-vanishing intruder.

Both Meteors and F-80s, we learned, have no difficulty in shooting down the "rats," as the Hornets were impolitely termed, provided they are accurately directed. With their G-suits, and the power-boosted ailerons fitted to their aircraft, the U.S. pilots claim, in fact, that they can out-turn the Hornet. A second "full-bore" beat-up by a Hornet, this time of a pair of "standby" Meteors, convinced us, however, that this fastest of twin piston-engined fighters is no mean opponent in the ground-attack role—given a reasonable share of the surprise element. Its high-altitude capabilities, too, should not be lightly dismissed.

There was encouragement in the spectacle of the R.A.F. and U.S.A.F. jet fighters taking off and landing alternately and operating under a single control system. Anglo-American co-operation seemed at its most natural; differences in equipment, tactics and phraseology were not outstanding enough to demand the presence of a U.S.A.F. representative in the control tower. Here, where an intelligence officer and operations officer kept in continuous contact with the zone control-centre, were received the orders to scramble, and the direction and altitude at which the fighters would find their quarries. By means of telephone lines from the tower to each "squadron ops." the requisite number of aircraft were kept in necessary stages of preparedness, and information on the position was relayed back to the control centre, where all phases of the battle were being plotted.

Four theoretical stages of readiness were in use. "Availability" meant that aircraft could fly within half-an-hour, those at "readiness" were given six minutes in which to become airborne, and the times allowed for "dispersal standby" and "runway standby" were four minutes and two minutes respectively. In practice, however, the Meteors, fringing the runways, and the F-80s at dispersal, were all getting away in just under two minutes from the scramble signal; the two latter stages named were one in effect.

Exercise *Foil* was the first post-war occasion on which R.A.F. and U.S.A.F. fighters have flown together under simulated battle conditions. At the re-birthplace of this happy and old-established alliance, many interesting questions arose. Operationally, there were few snags, as the American system of fighter control follows closely on our own. Their pilots spoke well of the swiftly given, accurate directions by which they were vectored to as many as three separate targets before fuel ran short.

Pilots' Preferences

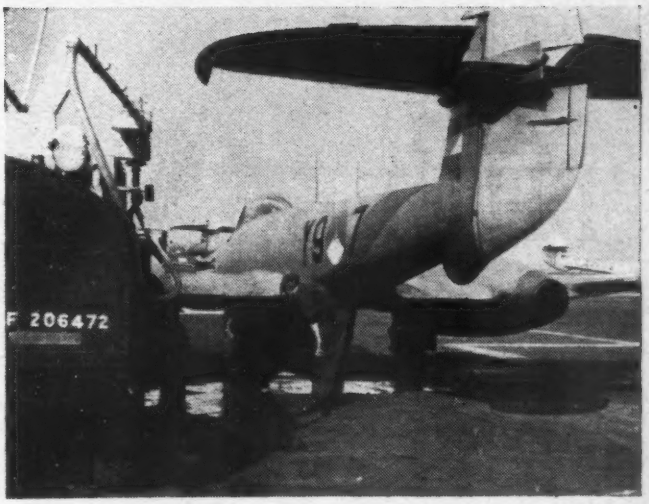
Several of the resident pilots had exchanged their Meteors for their guests' F-80s since the arrival of the American squadron, and mutual experience had been afforded. It seemed the healthiest of signs that each pilot we questioned admitted the merits of the other's aircraft, but preferred his own. The Meteor's higher all-round performance, derived from the great thrust of its Derwents, was the main talking-point for R.A.F. pilots, while their U.S. contemporaries quoted the F-80's better range on internal tanks only, its cleaner cockpit and power-assisted hydraulically operated ailerons. "Crash-hats," ejector seats and G-suits they regarded as prerequisites, and their combined airspeed and Mach indicator as a useful "extra."

Seeking some indication of the scale of a day's activity, we found that in the previous 24 hours there had been over 30 scrambles, with Meteors making nearly two-thirds of them. Interceptions resulted from almost every scramble, mainly of Wellingtons and B-29s, although there was frustration between the lines of a report, from two Meteor pilots, which told of accidental vectoring to a civilian DC-6. As always in mock air-warfare, almost every enemy sighted was put down by the interceptor as a kill. Notable exceptions to this rule were the P.R.U. Spitfires, which, flying fast at 40,000ft, had wrung admissions of failure from both F-80 and Meteor pilots. Of greatest

"Foil" Completed . . . .

interest were attacks on B-29 formations, which had been encountered several times, usually at heights below 20,000ft. Several of the U.S. pilots had practised interception on Superforts in American trials, and favoured near head-on attacks—from ten o'clock or two o'clock—as the safest and most certain way of making lethal contact. Direction to correct altitude at a distance of 15 to 20 miles ahead of the target is almost essential for this method, which allows very little time for sighting and firing, but is the best defence against the bomber's guns.

From a selection of films exposed during the previous day's combat came proof of the vigour with which the fighters had attacked. The majority of the approaches to B-29 or Wellington formations—seen to have been made from slightly below the bombers' "five, six or seven o'clock" viewpoints—showed excellent judgment of distance and deflection, although some were perhaps a little too slow. Despite the far higher relative speed, head-on attacks also appeared to have been very capably accomplished. R. J. B.



Refuelling Gloster Meteor 4s of the visiting Royal Netherlands fighter squadron at Thorney Island.

NIGHT DEFENCES

MAXIMUM station resources were put into the air from West Malling, Kent, at the height of the attack on Saturday night. Just before and after midnight the resident night-fighter squadrons scrambled Mosquitoes in pairs every ten minutes or so until the entire strength was airborne and under sector control. Until the aircraft had returned, however, it was impossible to discover how, from where or with what aircraft the raid was developing.

At a general briefing at 2200 hr the weather forecast promised a clear night with about three-eighths cirrus at 26,000ft, freezing level 13,000ft and no icing. It was thought that some patchy stratus at low level might affect the coast of East Anglia, so a met-reconnaissance Mosquito was sent off at 2200 while four other aircraft took off for a routine patrol. The met. aircraft returned to report no low cloud, and within 12 minutes that machine had again become an offensive weapon, at scramble readiness.

The ground crews consisted almost entirely of National Service men and their keenness in rearming and refuelling accounted for quick turn-round throughout the night. To them, as much as to the others taking part, the exercise represented justification for their months of training and the routine work of a peacetime R.A.F. station. It was impossible to determine average time for scrambling but, of the several pairs we timed, aircraft were taxying out about 3½ min after receiving the order and were actually airborne within six minutes. Again the National Servicemen played a very important part in their despatch.

From 2200 hr four aircraft were kept at readiness to scramble and four others stood by at fifteen minutes' notice. The remainder were called to readiness as required. There was little else to do but wait for developments and—but for a brief indication from control that some early aircraft had been picked up by night fighter patrols, thought to indicate a raid building-up over the Frisian Islands—we were left completely in the dark. Presently, as if good enemy intelligence had been at work, intruders appeared over the airfield just as the two routine patrols were making ready to take-off at 2300 hr. Several low-level runs were made by what we estimated to be some four or five enemy aircraft. That brief attack also relieved the monotony for members of the Anti-Aircraft Command, whose guns around the airfield and throughout the immediate neighbourhood were fully manned. At 2340 hr there was every indication of a major raid developing—it was, in fact, the attack described in "Lincoln Night Out" on the previous page. Two aircraft were scrambled at 2340 hr and within half an hour after midnight, as already mentioned, the whole station strength was airborne. Aircraft from the first routine patrols reported no contacts or directions for their first two hours, but from then onwards a number of highly successful interceptions were made, in spite of liberal use of *Window* by the bombers.

Each fighter was limited to three kills, after which it was to return to base. The basis of claims was that both bomber and fighter should flash a light as soon as they saw an opposing aircraft, and the aircraft which flashed first was entitled to claim a kill. Claims could be checked, since each bomber pilot was required to acknowledge with his individual code letter as soon as a fighter was seen to fire, and each fighter pilot in his subsequent report was required to give the letter flashed by each bomber attacked and the time and position of the kill. The bomber pilot had also to give his position at that time, so that the two could be reconciled and the effectiveness of attacks assessed.

One aircraft was vectored on to about 12 Mosquitoes of a Pathfinder force, one of which he chased and attacked over the Ipswich area. The pilot returned to his patrol line and met the main bomber force at about 18,000ft; he "shot down" a Lincoln and a Lancaster and, having made his three kills, returned to base. Another typical report was made by the Wing Commander Flying, who intercepted three aircraft, two over the North Sea and one over the coast. The weather, he said, was perfect for interception and definite visual identification was possible at about 800ft range. It appeared to be the general rule, however, to close right in and make certain visual identification at about 300ft. Other night-fighter pilots reported perfect interception from patrols at some 20,000ft and nearly all were vectored on to a large bomber stream which they followed across London, shooting, homing, identifying and claiming kills as they went. R. P.

R.AUX.A.F. BACK IN FIGHTER COMMAND

ON Sunday, July 3rd, the Secretary of State for Air announced at a conference upon the conclusion of Exercise *Foil* that arrangements are in hand to transfer squadrons of the Royal Auxiliary Air Force back from Reserve Command to their original parent body, Fighter Command. Air Marshal Sir Basil Embry, A.O.C.-in-C., Fighter Command, stated at the same time that nothing could please him more.

The reason given for the change was that the Auxiliary squadrons could more readily be placed where they would be needed for front-line defence in time of war. The status of the squadrons would, however, not be changed, nor was there any intention that they should in any way lose the time-honoured identity with their individual counties and cities.

The news of this new operational status for the R.Aux.A.F. is, incidentally, of interest in connection with the announcement—also received as we go to press—of certain details of the R.Aux.A.F. race which, as one of the National Air Races, takes place at Elmdon on Sunday, July 31st. One aircraft from each of the six hitherto-existing Reserve Groups, plus R.A.F. Northern Ireland, will compete for a bronze trophy presented by W/C. G. Cooper, M.P. for Middlesbrough West. Meteors, Vampires and Spitfires will take part, flying with all operational equipment except ammunition. Competing aircraft will cover four laps.

HERE AND THERE

Senior Promotions

WITH effect from July 1st, five Air Commodores have been promoted to Air Vice-Marshal, and 14 Group Captains have become Air Commodores. The new Air Vice-Marshals are Air Commodores Sir Harry Broadhurst, C. B. R. Pelly, D. A. Boyle, D. Macfadyen and H. G. White.

It Had to Happen

AT Croydon last Friday morning an Airspeed Consul of Airspan Travel, Ltd., was christened *Gorgeous Gussie*. Miss Gertrude Moran herself performed the naming ceremony, and was then flown over Wimbledon in the aircraft—G-AIOX—which began its maiden flight on Airspan's Croydon-Ajaccio schedule (first stop Corsica) at 9 a.m. last Saturday.

Brabazon Tests

THE Bristol Aeroplane Company has announced that the pre-flight testing programme for the Brabazon I will require a minimum of another two to three months for completion. Testing, it is stated, is proceeding satisfactorily and, considering the magnitude of the undertaking and the fact that much of what is being done is entirely new in aeronautical engineering, no serious troubles have been encountered. On p. 15 of this issue will be found an impressive aerial photograph of the Brabazon and the assembly hall at Filton.

Continental Rallies

TWO of the largest private air rallies ever held on the Continent began last week-end. Nearly 400 members and associate members of the Royal Aero Club flew to Deauville, Northern France, on Saturday, July 2nd, to attend the annual rally organized by Société des Hotels et Casino de Deauville They arrived in about 135 private and club aircraft, and stayed the week-end, leaving Deauville on the Monday morning. Many returned to the United Kingdom, but about 130 of them, in 50 aircraft, flew on to the Spanish rally organized by the Royal Aero Club of Spain. Due to assemble at Barcelona on the 4th July, the guests are flying around Valencia, Madrid, Jerez de la Frontera, back to Madrid, finishing up at Pamplona on 11th July.

STARS AT NIGHT: The U.S.A.F. has ordered 110 Lockheed F-94 two-seat night fighters, which have the same wing and fuselage structures as the standard Shooting Star and TF-80c trainer. This prototype is, in fact, a conversion of the two-seat jet trainer type. New features include an extended nose section, containing radar equipment, and a Solar afterburner, fitted to the tail pipe of the Allison J-33 turbojet.

FORTY YEARS BACK

"The War Office are seriously considering the formation of an Aerial Reserve, on similar lines to the Army Motor Reserve. Although there hardly appears to be a sufficient number of successful flyers, either men or machines, in this country from which to recruit such a corps, there is no doubt that those who own practical machines would be ready to loan them to the nation at a time of emergency." (*From "Flight" of July 3rd, 1909*).

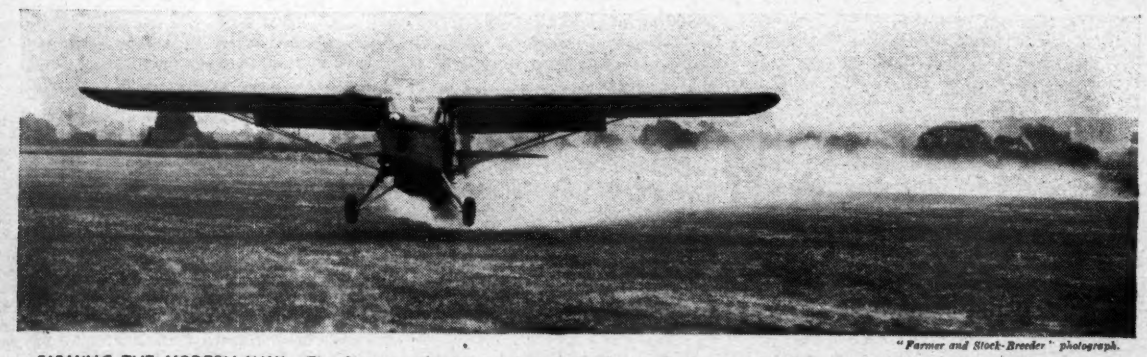
The "Mambathon"

HANDLEY PAGE (READING), Ltd., are confident that the Mamba-Marathon will fly sufficient hours before September 7th—opening date for this year's S.B.A.C. Show—for the machine to take part in the flying display.

Installation of the two Mamba turboprops has now been completed, and running tests are due to begin within three weeks. Few estimated performance figures have been released, but it is thought that the "Mambathon" will climb at over 2,000ft/min at sea level, and have a cruising speed of 260 m.p.h. At take-off, these Armstrong-Siddeley turboprops will deliver a total power of some 2,020 shaft h.p.

Pan American Appointments

TWO vice-presidents were elected at a recent meeting of the board of directors of Pan American Airways. They are Admiral John H. Towers, U.S.N. (retired), and Captain Harold E. Gray. Admiral Towers, who was Commander-in-Chief of the U.S. Pacific Fleet and Pacific Ocean Areas in 1946, joined



"Farmer and Stock-Breeder" photograph.

FARMING THE MODERN WAY: The first crop-dusting version of the Auster Autocrat, ordered by an Australian operator, was recently completed and is shown during a practical demonstration. Both dusting and spraying models of the Autocrat were described in "Flight" of March 17th this year.

STRATOFREIGHTER: The first of a U.S.A.F. order for 50 Boeing C-97As makes its initial take-off from Renton, Washington. A radome under the nose is a new feature of this pressurized military transport, which can carry up to 53,000 lb of freight, and has a maximum range of 4,600 miles.

Pan American Airways in 1948, and Captain Gray has been with the company since 1929 when he was one of the first ten pilots to be engaged.

Seattle Airport Opening

AN air display featuring U.S. Air Force, Navy and Marine aircraft will precede the formal dedication of the Seattle-Tacoma International Airport at Bow Lake on July 9th, after which the airport will be open for public inspection. To mark the occasion, special cachets will be stamped on envelopes provided by collectors.

A.R.B. Appointment

LORD Douglas of Kirtleside, Chairman of B.E.A., has been nominated as the representative of Group 1 (Operators) on the Council of the Air Registration Board. The appointment was confirmed by the Council on June 23rd. Lord Douglas replaces Mr. Gerard d'Erlanger, and will be due for retirement from the Council at the end of 1950. Other representatives of Group 1 are Mr. Whitney Straight, Col. Preston and Capt. G. P. Olley.

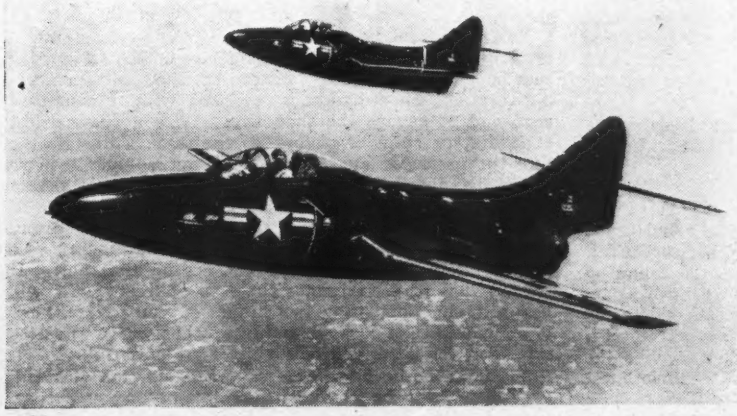
A Golfing Date

THE Aircraft Golfing Society has arranged a fixture for Wednesday, July 20th, at East Brighton Golf Course. In the morning an 18-hole medal competition will be played for prizes provided by the Society. There will be additional prizes for the leading senior and junior (who will qualify for the match play stages of the perpetual trophy), and a special prize for the best score amongst the visitors. After lunch there will be an 18-hole four-ball *v.* bogey contest, in which both partners and markers will be drawn.

U.S. Wartime Claims Revised

THE frankness commended in our review (May 26th) of the first Volume of *The Army Air Forces in World War II* apparently prevails in the second, for reports from Washington state that this part of the official history, an appraisal of the 1943 offensive, describes bomb damage to German industry in that year as "light and indecisive."

Furthermore, a sampling of intelligence reports of German aircraft shot down by American gunners had "indicated that 8th Air Force claims were far more exaggerated than even their severest critics had assumed." Revised figures for Battle of Britain losses suffered by the Luftwaffe were issued by the Air Ministry, it will be remembered, in 1947. These showed the difficulty of making an accurate assessment of enemy aircraft destroyed—R.A.F. claims were nearly 1,000 in excess of the correct figures—but were no discredit to the achievements of the men who fought.



INVISIBLE URGE: Externally, these two Grumman F9F Panthers—deck-landing fighters of the U.S. Navy—have an "all-American" appearance. Their source of power, however, is a fuselage-installed Rolls-Royce Nene, built under licence by Pratt and Whitney, and designated Turbo-Wasp.

News in Brief

THE third R.N.Z.A.F. squadron to be seconded to the Air Lift left New Zealand on June 16th.

* * *

Recent appointments within the Anglo-American Oil Co., Ltd., include those of Mr. R. A. Carder as chairman (in succession to Mr. David A. Shepard) and Mr. Leonard Sinclair as an additional managing director.

* * *

An exhibition of aerial photographs of ancient castles and religious houses is to be held at the Kodak Galleries, 184, Regent Street, London, W.1, from July 16th to August 6th, week-ends and Bank Holiday excepted.

* * *

A 45-page booklet has been issued by the aviation department of the Shell Petroleum Co., Ltd., showing the duties, taxes and dues payable on Shell aviation gasoline and Aero Shell engine oil throughout the world.

* * *

Hydro-Aire, Inc., of Burbank, California, manufacturers of aircraft fuel, hydraulic and pneumatic equipment, announce the appointment of a resident representative in this country—Mr. James R. Coen, with offices at 2, Dartmouth Park Avenue, London, N.W.5.

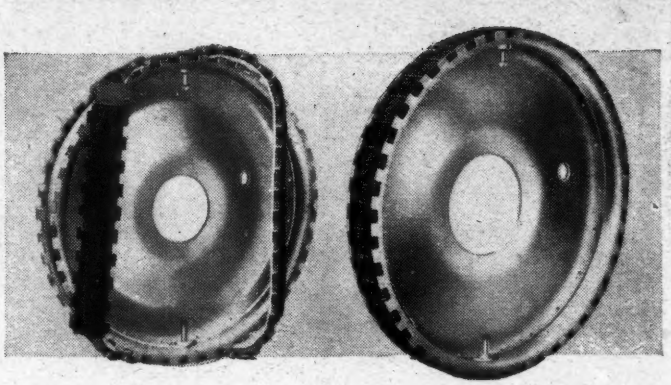
* * *

A French airwoman living in Fez, Mme. Marcelle Choisnet, is reported to have claimed a new women's world distance gliding record, with a flight of 96 miles. Mme. Choisnet holds the present endurance record for women with a 35-hr flight made last November.

WHEEL BRAKES

Their Development, Design and Use

Part 1: Construction of the Expanding-diameter Types



A successful pioneer design—the Palmer aircraft brake of 1927.

By MAURICE F. ALLWARD

ON very early aircraft, the low-powered engines then available demanded extreme lightness in the airframe and the need for brakes, in view of the low landing-speeds, was insufficient to warrant their additional weight. For running-up, engine chocks were invariably used. A few of the machines fitted with the first wheels and tyres specially developed for aircraft were fitted with a very crude form of cable-operated hand brake, but these were probably proprietary articles originally intended for other forms of transport.

It was not long, however, before speeds increased, and the proportionate lengthening of landing-runs began to raise problems of airfield size. The need for an efficient method of braking was recognized. Early experiments were mainly directed towards the development of car-type shoe-brakes. None of these was completely successful, and the distinction of being the first manufacturer to produce a brake specially for use on aircraft goes to the Palmer Tyre, Ltd., which firm placed the Palmer Aero Wheel Brake on the market in 1927. It proved to be just what operators had been waiting for, its chief merit being its extreme lightness. By comparison with present-day brakes it did not have to do much work, but for its weight it gave an exceptionally powerful braking effort in comparison with earlier designs.

Efficient Early Design

The brake consisted of an annular expanding tube to which was attached a complete ring of brake blocks. The tube lay in the bottom of a castellated channel, and when expanded either by air or fluid brought the blocks into frictional contact with the brake drum. The blocks were shaped to fit into the castellations and were thus prevented from rotating with the drum. There was nearly 100 per cent contact between the blocks and drum, and even a small pressure resulted in a much higher braking effort than hitherto had been attainable.

This first brake is noteworthy, because the basis of the design has remained unaltered in the modern drum brakes of to-day, and only now are the larger sizes gradually being superseded by the disc brake.

The then comparatively new British division of the Goodyear Tyre and Rubber Co. marketed their first brake one year later, in 1928. It was not altogether successful, and a disc type of brake was introduced the following year, incorporating bronze and steel discs controlled by hydraulic pressure. This was the first of its kind, and its success is proved by the fact that modified versions are still fitted to many aircraft, although now, like the expanding tube types, it is being superseded by the latest types of single-disc brake.

The first Dunlop brake—produced for a Westland aircraft—was marketed in 1929. The soundness of this and subsequent designs from Fort Dunlop needs no emphasis here.

Brakes in general use to-day may be divided into three distinct classes: internal-expanding shoe; expanding tube or drum; and disc-type.

The shoe type is extensively used on light aircraft and on helicopters, where demands are light and simplicity is important. It is interesting to recall that every operational German aircraft in the late war was equipped with such brakes. Most shoe-brakes are of the two-shoe type, but various methods are used for expanding the shoes and for making provision for adjustment to counteract lining wear.

Shoe brakes generally consist of a pair of rigid shoes to which are attached renewable linings. The shoes are hinged on one or two fulcrum pins and are operated by a cam located approximately diametrically opposite the fulcrum-point. The cam has a symmetrical outline and is in contact with the shoe "tips," so the respective shoe-displacements are equal for any given angular rotation of the cam spindle. Each shoe will dissipate half the total energy dealt with by the brake and the wear of the linings will be equal, due to the mechanical action of the cam.

The two shoes in such a brake, however, have an unequal tip-operating force from the cam, as one shoe is "leading" and the other "trailing." The leading shoe is the one in which the created friction force is resisted by the fulcrum pin, and the trailing shoe is the one the friction of which is resisted by the expander. To obtain an equal retarding force from each shoe, therefore, the tip pressure on the trailing shoe has to be greater than that on the leading shoe. If this is arranged, any form of located expander will then carry out-of-balance force, due to the unequal shoe-tip pressures.

"Floating Expander" Brakes

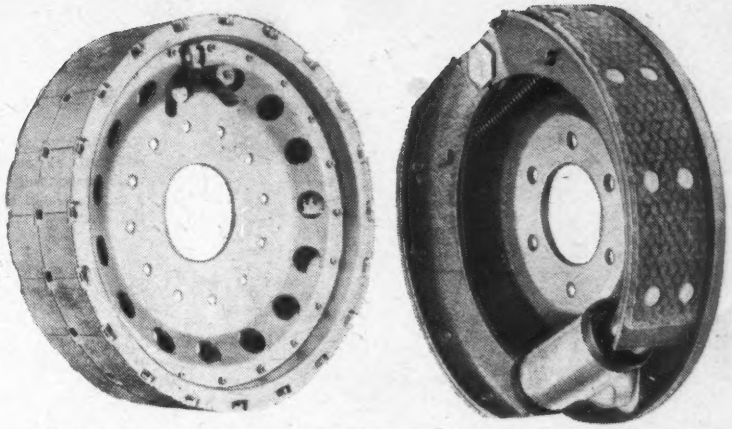
Many modern twin-shoe brakes have a "floating" expander, which may be mechanical—in the form of a cam or wedge free to float between the shoe tips—or alternatively, an open hydraulic cylinder with a piston at each end to engage the shoe tips. With a symmetrical expander, or cylinder pistons of the same diameter, the shoe-tip pressures are then bound to be equal. This alters the distribution of work done by the two shoes: the whole of the pressure on the leading shoe is available for creating force between the lining and the drum, whereas the equal shoe-tip pressure on the trailing shoe has to resist the created friction force on that unit. It follows that in such brakes the rate of lining wear will be unequal. Comparing two brakes of similar size, however, one with a located and the other with a floating expander, the latter will be slightly more powerful.

A further development of the simple, located-expander, twin-shoe brake is the two-leading-shoe type, in which full advantage is taken of the inherent self-energizing factor of each shoe. On such brakes the fulcrum points of each shoe are placed diametrically opposite each other, and the operating mechanism is arranged to apply the same effort at each shoe tip. The reason why this

Wheel Brakes . . . .

type of brake is not more generally manufactured is the design difficulty of providing a simple adjustment to ensure that the brake will always operate at maximum efficiency.

In the Bendix Duo Servo Brake not only are both shoes leading shoes, but the operating force applied to the primary shoe is transferred to the secondary one, and this force is augmented by whatever friction effect it produces. It is an arrangement that gives great power for a small size. Apart from studying the adjustment aspect referred to above, the designer of a brake operating on this principle has to take into special account the distortion arising from temperature changes. The ideal would be a brake drum with no thermal expansion or distortion, and a brake lining with an absolutely stable coefficient of friction. Both factors, of course, influence all rigid-shoe brakes, but the effect is much more pronounced in a self-energizing unit.



(Left) Goodrich "Duplex" expanding-tube brake of the type fitted to the Boeing Stratojet: the use of twin pressings bolted together is interesting, as are the large number of blocks, which are shouldered and butt against recesses formed in the frame. (Right) Girling hydraulic self-adjusting brake, showing cylinder with opposed pistons engaging the shoe-tips.

An unusually interesting twin-shoe design is the Girling Hydraulic Self-adjusting Aircraft Brake. Here, the main departure from the orthodox is that the linings are in constant contact with the brake drum whether the brake is "on" or "off." There is neither clearance nor pull-off springs. At first this might appear to cause unnecessary drag and wear, but the degree of contact is so fine that the drag is scarcely measurable and no heat is normally detectable. In practice, this initial pressure, upon which the whole principle of the design is based, is so slight as to be harmless, while the immediate response and increased sensitivity provide a high degree of braking control.

Minimum Movement

The brake consists of two shoes hinging on a fulcrum. Diametrically opposite is a cylinder containing a pair of short, opposed pistons. The outer end of each piston is slotted and engages with the tip of the adjacent shoe. At the back of each piston is a special cup washer and the pistons are separated by a light spring. Near the fulcrum end of the shoes is a tension spring, the main purpose of which is to hold the two shoes together sufficiently to prevent any tendency of the tip of the leading shoe to "grab" and also to balance the outward pressure of the spring between the pistons.

As the shoes are actually touching the brake drum all the time, it will be obvious that it is only necessary for the pistons to move very slightly in order to apply full pressure to the expanding shoes when the hydraulic pressure between them is brought into play by the master cylinder.

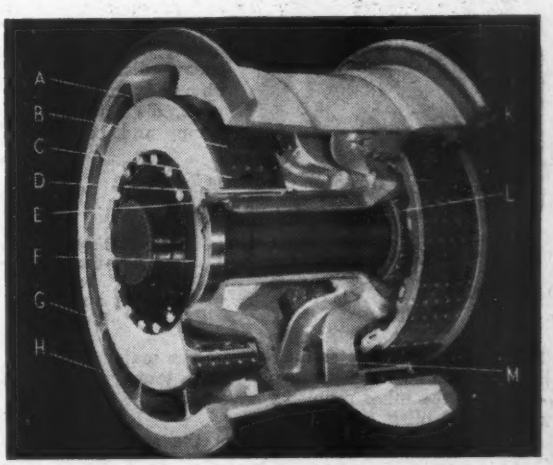
Only a small operating or "master" cylinder is necessary to give the desired mechanical advantage, since, due to the minute travel of the pistons, a very small fluid-displacement is required.

Small displacement, a desirable feature at all times, becomes most necessary on larger brakes if the master cylinder or fluid reservoir is to be kept down to a reasonable size.

Expanding-tube brakes differ little in principle from the Palmer Brake of 1927. Improvements have been concerned more with the development of constructional materials than with the basic design, which remains virtually unaltered. The changes that have been made can nearly all be traced to having been initiated to counter the effects of higher energy-dissipation requirements, resulting in higher operating temperatures to avoid too great a weight penalty. Major developments have taken place in the brake drum to prevent the heat generated from reaching and damaging the tyre, as will be explained in detail further on.

The rolled and pressed castellated-channel brake frame is now usually a very rigid aluminium- or magnesium-alloy casting, and the brake blocks are not attached directly to the expanding tube, but are positively returned and held by springs. A notable exception is the B.F. Goodrich Expanding Tube Brake, the frame of which consists of two pressings bolted together. The claim is made that this method of construction allows the brakes to be made lighter than are any other type of brake for a given amount of kinetic energy. The penalty paid for this extreme lightness appears to be an abnormally wide brake-drum projecting beyond the wheel.

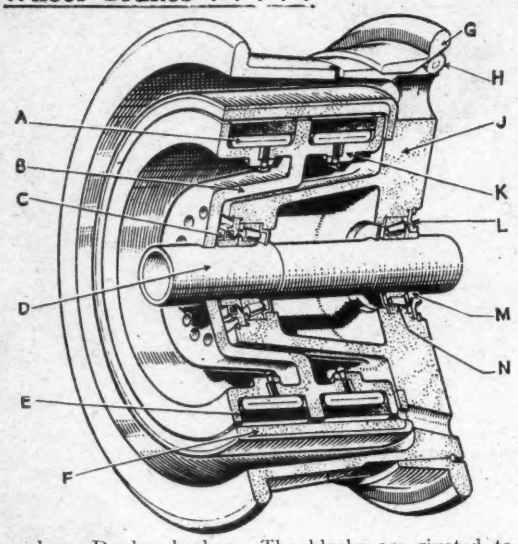
Operation of tube brakes can be either pneumatic or hydraulic. If the hydraulic method is used it is advantageous to keep the nominal clearance between the blocks and braking service to a minimum, in order that the size of the reservoir may be kept down. The torque of the blocks can be taken either by butting directly against projections on the brake frame, or by riveting the blocks to a saddle which takes the load. This latter method is



A = Cooling Vanes.
B = Brake drum.
C = Lining.
D = Air-bag.
E = Inflation valve.
F = Bearing retainer.
G = Backplate.
H = Hub.
J = Detachable flange.
K = Lock-ring.
L = Taper rollers.
M = Staggered U-spokes.

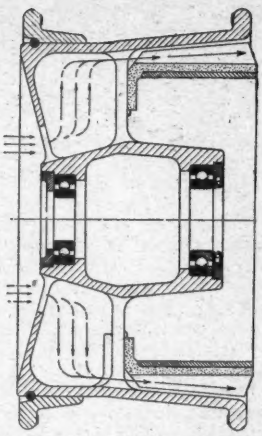
A typical Dunlop aircraft brake sectioned to show the internal construction.

Wheel Brakes . . . . . .



(Right) Diagram of the Palmer cooling system: centrifugal action carries air over the fins cast round the drum.

(Left) A special Dunlop wheel designed to accommodate a wide expanding-tube brake: a key to the details shown in the drawing appears below.



A = Pressure bag.
B = Torque plate.
C = Oil seal.
D = Axle.
E = Lining.
F = Drum.
G = Loose flange.
H = Lock ring and bobbin.
J = Hub.
K = Torque-plate flange.
L = Excluder.
M = Locating ring.
N = Taper-roller bearing.

used on Dunlop brakes. The blocks are riveted to an inverted-U fitting, the side projections of which pass either side of the tube through slots in the brake frame. When assembled to the brake a metal strip connects these two ends and between the strip and brake frame a powerful spring in compression is fitted. This normally retains the blocks and pulls them clear of the brake drum.

A different method is used in Palmer brakes. The ends of the blocks are slotted horizontally and into this slot a flat spring is fitted, the ends of which engage lugs around the edge of the frame, each spring securing the ends of two blocks. The ends of the blocks are shouldered and butt against the lugs, by which the torque is taken.

The development of the expanding-tube brake has been largely bound up with the development of the drum, where the problem, basically, has been (and still is) to prevent distortion and to avoid excessive weight. Some idea of the magnitude of the "heat generated" problem with which brake manufacturers are faced is given by the fact that drum temperatures are being allowed to approach red heat in the quest for low-weight energy-dissipation. At these temperatures wear, distortion of the drum, and cooling of the expanding tube after braking are the major problems. Brake "fade" at high temperatures has largely been overcome, but the other problems have yet to be solved both for this and other forms of brake.

An efficient cooling system—the Palmer finned brake-drum housing assembled in a wheel hub.

In early designs, and in some of the smaller types of wheels for lightly loaded aircraft, the drum or drums were pressed into the hub casting, under the rim of the wheel. With the demand for higher torques this arrangement caused difficulty through heat-conduction to the tyre and through distortion and loosening of the drums. Modern practice is to make the drum smaller than the wheel rim in order to provide an insulating layer of air between the two. This feature was adopted on German brakes.

A disadvantage of so isolating the drum is that all the heat generated then has to be dissipated from the drum itself, and the possible heat-absorption capacity of the wheel and tyre, which is by no means negligible, is lost for this purpose. The ideal design would have the brake, wheel and tyre all reaching, but not exceeding, their maximum permitted temperatures.

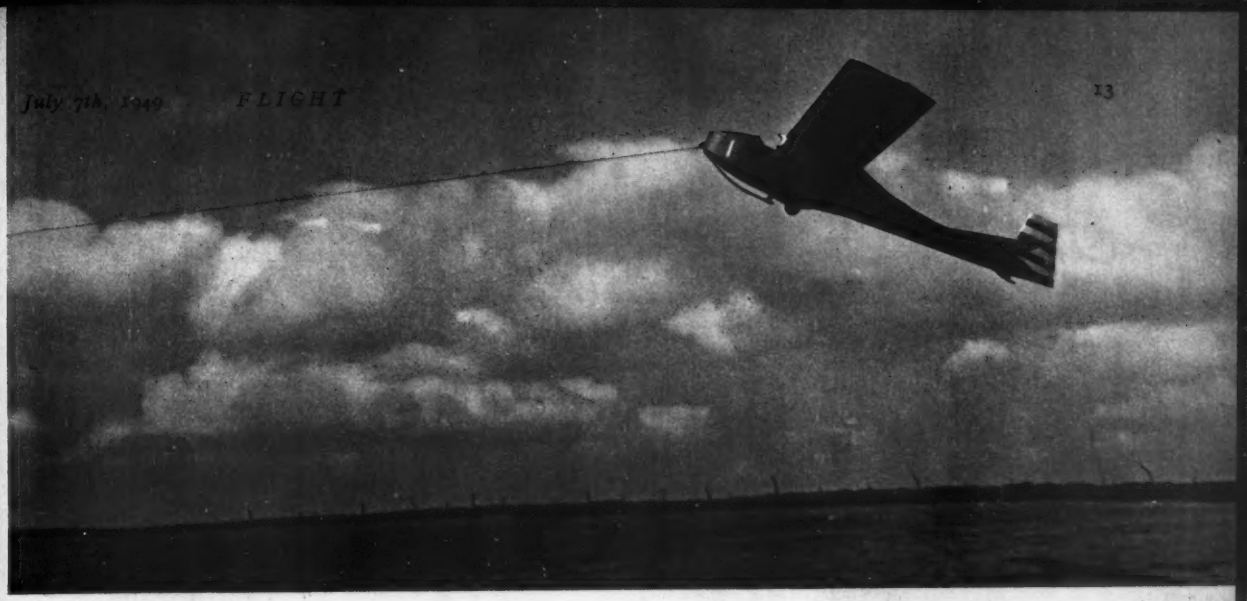
The gap between the drum and wheel can be ventilated by means of vanes cast on the underside of the rim to cause a flow of air over the drum, as is done on some Dunlop wheels. The outer face of the drum is often ribbed, further to speed up the dissipation of the heat. A highly efficient scheme is used on the larger Palmer range of tube brakes. A forged steel or alloy-iron drum is surrounded by a cast-magnesium housing with machined or cast cross-fins; not only has the magnesium a high specific heat, but the fins are air-cooled by an axial flow of air generated by the centrifugal-fan action of the specially shaped arms of the wheel casting. This involves a specialized foundry technique both for the wheel and for the drum, but has proved to offer excellent cooling properties, particularly if the aircraft is taxied without brakes for a short period after landing.

The need for tyres of the smallest possible diameter in order to ease the stowage problem on modern aircraft has led to the use of high inflation-pressures. While this resulted in only a slight decrease in rim diameter for a given load the width available for the brake has been considerably reduced, because of the narrower tyre-section and the fact that the tyre only just overlaps the rim flanges. This, together with the increase in heat from the higher torques required, made it imperative to arrange a more effective method of dissipating the heat. It is for this reason that there is a tendency to use ventilated discs in place of drums for very-high-duty types of aircraft. More than this it is not possible to predict at the present stage, although there are some who consider that, in time, ventilated discs will completely supersede the expanding-tube brakes.

(In the second and concluding instalment of this article disc-type brakes will be reviewed and some general considerations discussed.)

ABOUT DIESEL ENGINES

STUDENTS of engine design whose interest extends beyond aircraft engines—and such wider appreciation is essential to the serious acquisition of knowledge—will find the principles and applications of compression-ignition comprehensively dealt with in the recently published eleventh edition of *The Modern Diesel*. Edited by G. Geoffrey Smith, M.B.E., and revised by Donald H. Smith, M.I.Mech.E., Assoc. Inst. T., this work goes very fully into the design and construction of diesel engines and their application in various spheres. Though—until and unless new researches are made—the use of diesel power in aircraft is now historical, the experiments of Bristol, Napier, Junkers and others are reviewed in the final chapter of the book. The publishers are Iliffe and Sons, Ltd., London, and the price is 7s 6d (postage 4d).



Gliding Instruction

THE MOVEMENT AT THE CROSS-ROADS : WHICH WAY OUT?

By Ann Douglas

ONE of the biggest problems in its history faces the gliding movement to-day. It centres upon instruction, and, like most of the others the movement has to face, is inextricably bound up with money—or, more accurately, with the lack of it. Gliding is a sport involving high standards of technical equipment; it is also mainly in the hands of the young and impecunious. High technical standards, particularly in the aircraft, are recognized as an obvious necessity, but they are a great burden which other sports (such an dinghy sailing and mountaineering) do not have to face, although catering for a similar class of people. In gliding clubs it is the equipment, its maintenance and its insurance which absorb the bulk of the clubs' hard-earned income.

This fact is important, as it means that the payment of competent instructional staff cannot normally be contemplated. In a club dealing with any other comparable sport, the man takes precedence over the equipment, with the consequent opportunity for efficiency on the instructional and operating side. Yet in gliding, with the far more valuable equipment that is necessary, instruction in its use is largely in the hands of untrained amateurs.

Problem No. 1, therefore, is the serious lack of balance between the tremendously high technical standards now required of gliders, and the forced low standard of instruction caused by the inability to pay for both, while still keeping charges from a suicidal rise. This position is becoming worse. Club members are unable to afford even the flying that they did last year, and aircraft are costing more to maintain under the new regulations, while, due to the impossibility of paying for high instructional standards, many expensive gliders are getting broken, and insurance premiums have now reached a critical level.

There are many reasons why entirely amateur instruction is inefficient. First, regular week-day flying is not possible, and this keeps aircraft utilization at an uneconomic level. Secondly, the amateur, however experienced, must inevitably have his business or working interest foremost in his mind and cannot be expected to give up all his week-ends in teaching others.

The inevitable outcome is the rota system, whereby a number of the more experienced members take it in turn to be Instructor of the Day. This means that the pupil is constantly switching instructors, with bewildering variations in briefing and attitude. It also means that, more often than not, the instructor himself has never received any proper training for the job. On the credit side, we must allow that the rota system does help to maintain the unselfish team spirit necessary to the operation of gliders.

However, even when it is possible to pay for a full-time professional instructor, we at once come up against problem No. 2—the shortage of suitable candidates. The clubs obtain most of their instructors by training-up suitable and willing members, and although the practical work of such people may be good, their basic training in the art and science of instructing is usually sketchy in the extreme. Again, instructors drawn from this source, even when they possess the necessary training and experience, are seldom able or willing to give up their own jobs to become professional gliding instructors with financially uncertain futures.

Although there are, thus, insufficient trained instructors even to supply each active club with one professional, this aspect is bound up with problem No. 1, in that if the prospects of obtaining employment in this sphere were sound enough, candidates would make it their own business to obtain adequate training.

Background Picture

Why have these problems of instruction now become so acute when British gliding has managed to carry on without undue difficulty for twenty years? The reason lies in the changes in technique and equipment which, particularly since the war, have altered the situation. The classic method of teaching people to fly in gliders is by solo training. In this method the pupil first of all slides along the ground, learning the use of ailerons and rudder, then is allowed to become just airborne so as to begin to learn the use of the elevator. He then proceeds by progressively higher hops on straight flights until he is good enough to practice "S" turns, and then go on to circuits. One of the disadvantages of this system is that it is difficult to prevent dangerous misuse of the elevator; but of more importance is the fact that, for all the briefing the instructor may give before the launch, the pupil is for all practical purposes teaching himself from the moment he is airborne.

The solo training system was originally developed by the Germans, after the first World War, when they had been forbidden to fly aircraft, and in any case had no money. Motorless aircraft got them round the law; home-built, cheap, light gliders, with no frills such as cockpits, plus a rubber rope pulled out by free man-power, overcame the cash question, and incidentally built up the nucleus of the Luftwaffe. Centres were set up in hilly districts,

The heading illustration—a Cadet being winch-launched—is a scene from the gliding film "Wings for Pauline," distributed by Associated British-Pathe and recently reviewed in these pages.

such as the Rhön mountains, where hill lift also existed for soaring.

Round about 1930, when gliding seriously came to England, an identical method was naturally adopted, as was a similar sort of terrain; clubs were formed on hilly sites, and such sites usually had undulating land in the immediate vicinity. Some of the clubs became established, and the system continued. The open, high-drag gliders were suited to the undulating country; they could be "bungied" off the top of the hill and, as they were not able to glide far, the restricted landing area was not inconvenient. If they crashed the pilot was invariably somersaulted off to the grass, usually without injury. The glider was cheap and easy to repair.

England, however, has only a limited number of suitable hills and, as time went by, clubs started on the flat lands. Here the German method did not fit; a hand-pulled "bungie" barely got the glider airborne—and if it did, the high-drag craft was soon back on the ground again. The first practical step to overcome this difficulty came with the development of towing on a longer rope behind a car, and eventually by winch launching, which took machines to 600-1,000ft.

The second step was a move to reduce the drag of gliders, so that as pupils progressed they could get better flights without the introduction of a further type. This second step, however, might not have had the effects that it has, but for two factors. There grew considerable prejudice against the open primary glider as *looking* frightening, and thus putting people off; so the A.T.C. standardized Cadet secondary trainers for use in primary training. Widespread use of the Cadet by the A.T.C. affected the decisions of the clubs as to whether they would continue to use the open primary gliders or change over to Cadets. The war settled the matter: at its end, Cadets were in production and primaries were not, and the clubs were in a hurry to get going once more.

Gliding Instruction . . .

The effect of this decision has been considerable. First, Cadets are at least twice as expensive both to build and to repair. Secondly, their glide is flatter, and they therefore require better judgment to land in restricted spaces. Thirdly, the controls, particularly the elevator, are more sensitive; this increases the chance of damage during the early low-hop stages when the pupil is teaching himself the use of this vital control. Fourthly, if a machine of this sort is crashed, the pupil is much more likely to get hurt, because of the more rapid acceleration inherent in the cleaner machine, combined with the mass of potentially damaging structure in front of the pilot. Fifthly, they inspire the pupil with more confidence in his own ability than did the open primary. As a result, the effect of each breakage on the finances of the club is much greater, and the instructor requires more experience to prevent such mishaps.

The above are some of the reasons why gliding instruction by established methods has become both more difficult and less safe. In an effort to improve standards and to reduce, from all points of view, the expense of crashery, some clubs are tending to give more dual instruction. This has been made possible only by timely introduction of the T21b, which is the first British production two-seater which has possesed the necessary characteristics.

With the two-seater, it is possible to teach proper flying from the start, correct mistakes before they end in expensive damage, check on pilots who have not flown for some time; and, at hill-soaring sites with difficult landing grounds, instil proper approach-planning. Financially, once first cost has been met, the two-seater earns better than does any single-seater because of the wider range of uses to which it can be put, and because of the greater variation of weather conditions in which it can usefully be flown.

In France and Switzerland, training is almost entirely carried out on two-seaters, the solo method having been discarded on the grounds of expense and slowness. In England, however, the solo tradition will die out only gradually. The combination of high capital cost and lack of experienced instructors is too difficult a problem for many clubs to overcome. If two-seater instruction were insisted upon, several of the smaller clubs would not be able to operate at all. With the bigger clubs, it is the instructor difficulty more than the capital outlay which is preventing the complete change-over in those cases where the desire to change already exists. The Instructor-of-the-Day system presents even more disadvantages when the training is carried out in two-seaters. For instance, frequent change of instructor may be more upsetting than it is with solo training. In addition, the instructor's flying must be particularly accurate, so that the clubs will probably have a smaller list of capable members from which to make out their rotas. Perhaps the biggest disadvantage, however, is the fact that an airborne instructor cannot control launching and flying from the ground. With solo training, one instructor can supervise all flying by standing on the ground at the launching end, and directing accordingly. With dual instruction, not only is a ground controller required in addition to the instructor, but few instructors are physically capable of giving continuous dual in gliders throughout the long summer days.

Therefore, although dual training, with its advantages of safety, proper tuition, and increased utilization, is certainly within the financial reach of the major clubs in the country—in fact, most of them do possess a two-seater—the giving of all training by this method is still far from realization, because of the impossibility of finding enough adequately trained instructors of either amateur or professional status.

The bastard method of solo training with occasional dual checks, which is fairly widely practised as a result, helps pupils over some of the difficult stages in their solo flying, but suffers from a number of disadvantages peculiar to each method. On balance, it is better than all-solo, but it is not a really satisfactory answer.

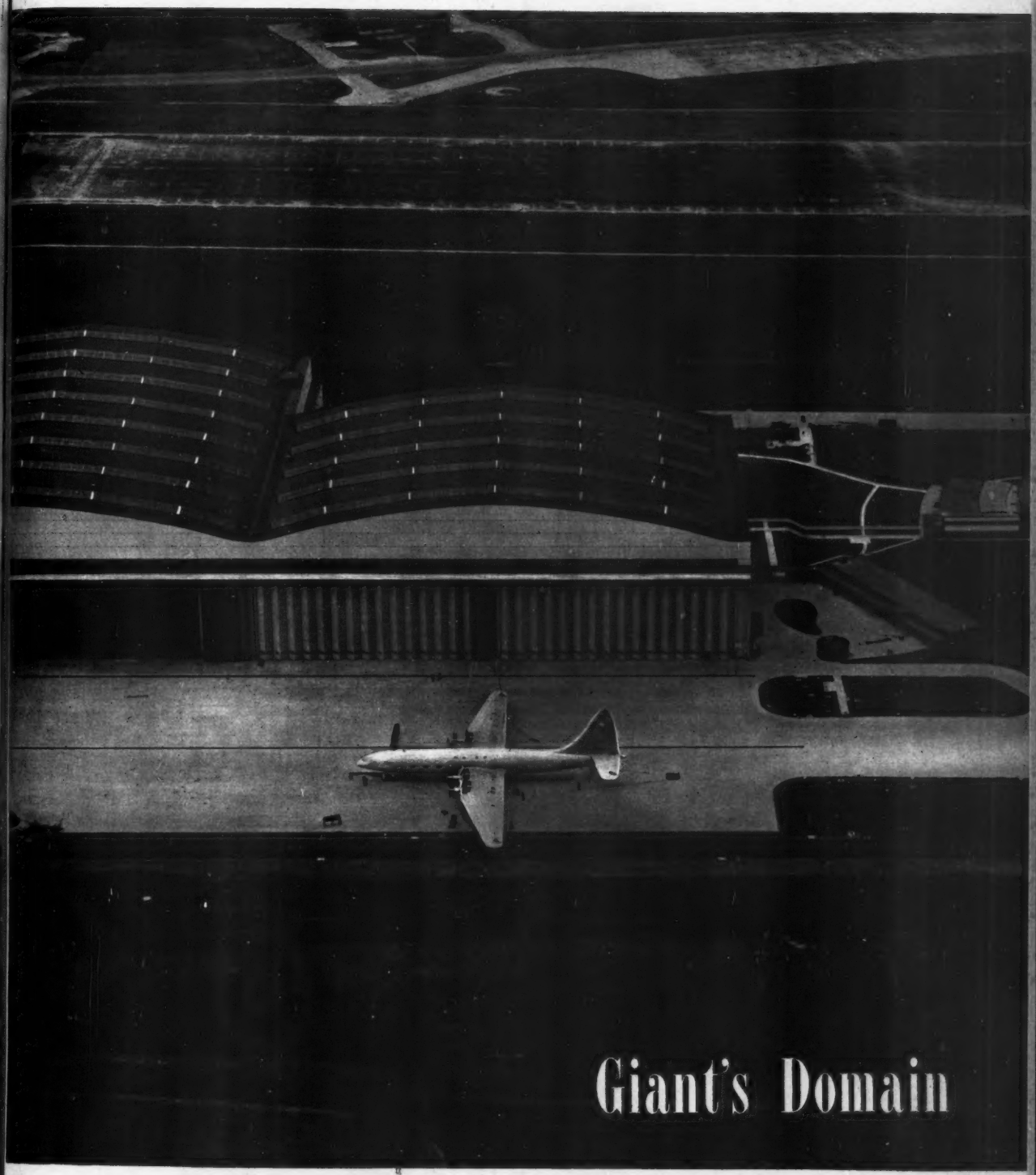
We are, then, faced with the facts that the method of instruction in general use is unsatisfactory, that instructors are mainly untrained, and that the clubs can afford to do little to remedy matters. It is a state of affairs that can only get worse, because the effect on the insurance companies is disastrous, and because many potential glider pilots are losing interest, due to inefficient, interrupted training.

Possible Solutions

Problem No. 1—the lack of proportion between the amount which has to be paid out for the aircraft and its maintenance, and that which is available for the improvement of instructional standards—can only be overcome either by reducing the airworthiness requirements, or by materially assisting clubs to raise their instructional standards, or by both. The former object could be achieved, and without lowering the safety of gliders, by a careful pruning of the requirements as they at present stand in the light of pre-war experience and records, and by the delegation of powers. The latter could be achieved by making a direct grant to those clubs whose instructors reach a certain status, or by making available without charge E.F.T.S. pupil-and-instructor courses.

Problem No. 2—the lack of available candidates—would largely disappear once opportunity were created for the chance of reasonable employment, and would certainly be helped by free training. Once the standard of instruction was raised, improvement would automatically follow. Methods of instruction would develop, because the instructors would be competent to make progress, or change over to dual instruction, which, in many cases at present, they are not. General operational discipline would improve, and the number of breakages decrease. Lastly, more pilots would reach the state of proper soaring in high-performance gliders, which is, after all, the whole object of training.

The instructor to-day is the man who cannot be paid for, and is without any status; yet he is the key man, the only man who can ensure the progress, even the survival, of the gliding clubs.



Giant's Domain

The Bristol Brabazon I (span 230ft), a section of the assembly hall (overall width 1,052ft) and a stretch of the 2,750-yd-long, 100-yd-wide runway, are presented together in this Aerofilms record of gargantuan activity at Filton. The total floor area of the hall—which is the largest individual building in the world entirely devoted to aircraft assembly—is 290,000 sq ft or nearly seven acres.

A Policeman's Lot—

NOTWITHSTANDING the exacting nature of its duties (accident investigation, rescue, guarding against infractions of air safety regulations, and co-operation with ground police), the Aviation Bureau of the New York City Police has a happier—certainly a more interesting—lot than do many constabulary organizations. The Bureau has a staff of seventeen (seven pilots, ten mechanics). At their head is Capt. Gustave Crawford (seen in the foreground of the picture opposite), a policeman for seventeen years and a pilot for twenty. Headquarters are on one side of the U.S. Navy's Floyd Bennett Field, in Brooklyn. Three pilots are already qualified on helicopters (one of which—a Bell—is seen in the uppermost view) and two more are undergoing training on the "egg-beater." The Grumman Goose amphibian (below) has proved invaluable.

CIVIL AVIATION NEWS

MADEIRA SPECIAL: As associates of B.E.A., Aquila Airways Ltd., are flying a weekly service, on Saturdays, from the United Kingdom to Madeira. The flying boat "Hampshire" is seen taxying out at Southampton. With the 52-seater version of the Hythe, day trips have recently been made from Falmouth to the Scilly Isles on behalf of the Falmouth Corporation.

Corporation Merger : B.O.A.C. Chairmanship : Livingstone Delay

PERCIVAL PRINCE TOURS

AS mentioned some weeks ago in *Flight*, Percival Princes have been concurrently undergoing development tests, two overseas and one at Boscombe Down. Proving flights were undertaken to Africa and India and it is from the former that the first aircraft recently returned after flying some 25,000 miles. A.R.B. tests were made in various changes of climate at different heights and temperatures, on such airfields as Karachi, Nairobi, Johannesburg and Accra, and single-engined take-offs were made at fully laden weights from high-altitude airfields in extreme heat and, at times, in sand storms. It is understood that the Alvis Leonides engines behaved perfectly in these conditions, and that throughout more than 170 hours flying only minor adjustments were necessary.

The second proving flight, to India, was flown under conditions assumed to be those which are encountered in normal airline operation on a typical route through Europe, Lebanon, Iraq and Pakistan to Bombay. One stage of the flight—from Karachi to Baghdad, a distance of 1,630 miles—was completed in 10½ hr. Demonstrations were given, but they took second place to the primary purpose of discovering the sort of troubles which might be expected in operating the Prince in extreme conditions.

One of the Hunting Air Travel senior pilots accompanied the aircraft to India to advise from the operator's point of view, and Percivals are confident, in the light of the experience of both trips, that many small teething troubles have practically been eliminated. Testing with the third aircraft at Boscombe Down for A.R.B. purposes is continuing; in all, a total of over 500 hours' trial flying has been carried out on this type during the past year.

MERGER BILL

IN moving the second reading of the Airways Corporation Bill last week, Mr. Lindgren, Parliamentary Secretary to the Ministry of Civil Aviation, argued that the amalgamation of B.O.A.C. and B.S.A.A. would make for greater efficiency. It was the Minister's view that the difficult aircraft situation of the present time and near future could be overcome only by a merger of the two airlines operating over the Atlantic Ocean. Since B.S.A.A. had various operating rights and contracts with South American countries the transfer might take some time and B.S.A.A. would form a separate division of B.O.A.C. for the time being. Certain economies in aircraft utilization and in booking and administrative staff would be possible, but there was unlikely to be much change in operational or maintenance services owing to the expansion which was expected as a result of the combined operations.

The Opposition opposed the Bill, Mr. Lennox Boyd expressing the view that the present arrangements would never work and that the Bill would be followed by another to create a giant monopoly. Whereas Mr. Lindgren had said the Boards and employees of both Corporations were in favour of the amalgamation there were suggestions from both sides of the House that B.S.A.A. employees were in fear of losing their jobs.

At one stage, towards the end of the debate, Mr. Lindgren suggested that the Opposition should attack the aircraft industry as they had attacked the airline operators, and he went on to say that the present difficulty had arisen because of the failure of the availability of British aircraft. Tudors had gone out and the only aircraft which promised to be in the running was the Hermes. He then referred to the late delivery of these aircraft.

Arising from his remarks, it should be remembered that the Hermes incorporates new features and that development has taken perhaps longer than was at first estimated. Nevertheless, the first Hermes flew only nine months ago and already trials are well advanced at Boscombe Down; B.O.A.C. will probably receive their first of the type in a very short time.

SIR MILES TAKES OVER

ON Thursday last, Sir Harold Hartley, K.C.V.O., C.B.E., F.R.S., M.C., retired from the chairmanship of the Board of British Overseas Airways Corporation and was succeeded by Sir Miles Thomas, D.F.C., M.I.Mech.E., M.S.A.E., who has been deputy chairman since April 1 last year. Mr. Whitney Straight, C.B.E., M.C., D.F.C., has succeeded Sir Miles as deputy chairman and (as announced recently in the House by Mr. Lindgren) it is intended that, on the passing of the Airways Corporation Bill, now before Parliament, for the merger of B.O.A.C. and B.S.A.A., Mr. J. W. Booth will become an equal and joint deputy chairman.

The other members of the Board of B.O.A.C. are Major J. R. McCrindle, O.B.E., M.C.; Lord Burghley, K.C.M.G.;

Civil Aviation News . . . . .

Major R. H. Thornton, M.C.; Sir Clement Jones, C.B.; and Mr. H. L. Newlands, M.B.E.

On the eve of taking over, Sir Miles Thomas paid tribute to Sir Harold Hartley for his guidance and inspiration. The time he had spent as deputy chairman, he said, had left him in no doubt about the manifold problems which had yet to be tackled, but he was impressed by the determination of the Corporation's staff to overcome them. The organization was being "streamlined" and every employee's task was now more clearly defined than was possible during the transition period following the war, when uneconomic airliners made from converted bombers had to be introduced hurriedly. Sir Miles said the annual deficit was coming down, and the capacity-ton-mile per employee was increasing encouragingly.

JATO AT LA PAZ

BRANIFF International Airways have started the commercial use of JATO (jet-assisted take-offs) from La Paz, Bolivia. The airport is 13,398ft above sea level, and until recently the airline was flying DC-3 services on the route from Lima. It is understood that the standard DC-4 can be operated without assistance from La Paz, but JATO equipment has been provided to increase safety and permit heavier take-off loads from that airfield. Each aircraft is equipped with four JATO rockets, two on the underside of each wing, at the root. The pilot initiates the rocket action by a switch in the cockpit, and the combined effort from the four is equivalent to some 1,200 h.p.

PROCTOR ACCIDENT REPORT

THE Chief Inspector of Accidents has reported on the circumstances of the accident to a Proctor V, G-AGTD, which occurred at Kingstown airfield, Carlisle, on October 18th, 1948. The aircraft, belonging to Astral Aviation, Ltd., had been chartered to fly two passengers from Newcastle to Carlisle and return.

Kingstown was unlicensed, but permission to land was given subject to the operators doing so at their own risk. The flight to Carlisle was uneventful, and it was during the take-off from Kingstown (where an additional passenger had emplaned) that the accident occurred. A 750-yard take-off run was available in the direction chosen. The first 600 yards was uphill, and when the aircraft reached the top of the slope it was still not airborne, and was rapidly approaching the boundary. The pilot, Mr. J. G. Robson, throttled back and applied brake. He was, however, unable to prevent the aircraft crashing into the adjoining field. It was severely damaged and the three passengers were injured. On examination, it was found that the surface of the ground was very soft and muddy, and in some places the grass was over 12in high. At the point where the take-off began, the wheels had sunk into the ground to a depth of 4in. The Chief Inspector is of the opinion that the accident was due to the retarding effect of the airfield surface conditions on the fully loaded aircraft during its take-off run, and that the pilot should have appreciated the situation. With the second observation the pilot did not agree.

AIR-LIFT ACCOUNT

PREPARED by the Air Ministry and the Central Office of Information, an account of the Berlin Air Lift has been published by H.M. Stationery Office. To claim, however, that it is an account of the British contribution is a mis-statement, in that the effort of the British civil charter companies has once again been left almost unnoticed. Mention is certainly made in several places of the immense value of the civil contribution, particularly in respect of the special experience and equipment which some of the operators had for carrying large quantities of liquid fuel; but there is a lack of detailed description of their particular operations. Moreover, although the publication is adequately illustrated, there are but two photographs of civil aircraft.

In spite of these shortcomings, the publication makes interesting reading, particularly in its exposition of traffic-control methods and the development of the Air Lift.

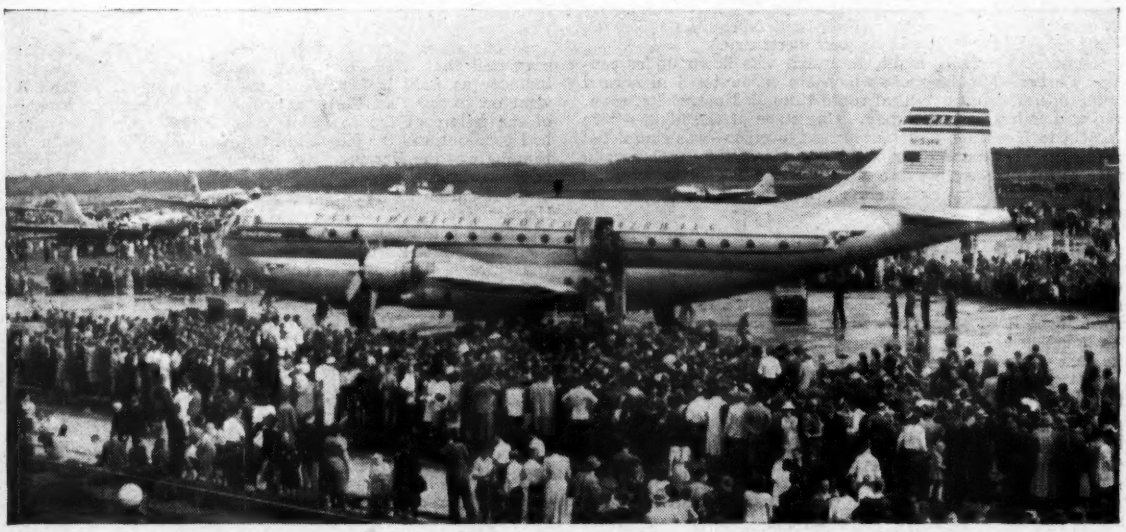
British losses during the Air Lift have totalled 23 men killed in seven crashes, three of which involved civil aircraft.

AERADIO PROGRESS

ELEVEN airlines, in addition to the British Corporations, now have holdings in International Aeradio, Ltd. All or part of the air/ground circuits, radio aids to navigation, point-to-point and meteorological broadcasts are operated by I.A.L. at 17 stations on the main trunk routes and I.A.L. officers handle air-traffic control and flight information service at seven. Asmara and Sharjah airports are now completely under the company's management, while a special representative is maintained in Turkey and I.A.L staff have been seconded to the Syrian Government. It is rather interesting, also, that a specially equipped mobile unit designed by I.A.L. provides traffic control facilities for aircraft visiting Newmarket airfield for race meetings.

Other services now provided by the Company include briefing, radio maintenance up to C. of A. standards, and the provision of qualified technicians and other staff as consultants and advisers to the Crown Agents for the Colonies and various governments. The *Aerad Flight Guide* has formed a compact radio manual with world coverage, and there is an efficient amendment service; more than 100 operators are now subscribing to this service, which is compiled from official information. In special instances along the main traffic routes used by British and American operators the British company is working in co-operation with its American counterpart, Air Inc.

In view of the participation by airlines, referred to above, it is of interest briefly to quote some figures from the Aeradio report and accounts for 1948. A profit of £20,192 is shown,



GERMAN INTEREST: A P.A.W.A. Stratocruiser on a recent visit to Frankfurt created a great deal of interest amongst the civil population. Pan American Airways are planning a regular Stratocruiser service between the U.S.A. and Germany, to start next December.

from which has been deducted an adjusted loss (brought forward from last year's account) of £11,477, leaving £8,715. After setting aside the sum of £7,500 to meet the company's anticipated liability for taxes, there is left £1,215 to be carried forward. The turnover for the year amounted to £557,499, compared with £131,817 for the financial year of 1947. The largest expenditure—for overseas operations—totalled £464,806, but the overseas income exceeded that figure by more than £2,000. Three members of the Board, retiring by rotation—Captain A. G. Store, Mr. Whitney W. Straight and Mr. J. V. Wood—have offered themselves for re-election.

International Aeradio expect that the demand for radio and other facilities in many parts of the world will continue, and that expansion of the company's activities will mainly be to encourage and initiate the formation of locally registered companies or associations. It is expected that additional technical advisers to local administrations will be made available to improve services for civil air operations.

COMBINED OPERATION: Towed by a British Ferguson tractor, one of the eight DC-6s of Swedish A.B.A. is here seen being placed ready for loading. With four other aircraft of this type—from D.D.L. and D.N.L.—the combined S.A.S. airline flies DC-6 services from Stockholm and Copenhagen to Paris, Istanbul, Nairobi, Teheran and Amsterdam as well as across the North and South Atlantic.

ATLAS TOUR

PHOTOGRAPHS of the interior of *Sky Merchant*, the Douglas DC-4 "flying showroom" owned and maintained by the Atlas Supply Co., appeared in *Flight* last week. In addition to the display of the owners' products, the aircraft carries its own ciné projection apparatus, and shows sound films covering technical and sales aspects of the company's activities.

The present tour of North Africa and Europe represents the third international flight undertaken since the end of the war. After visiting all the important cities in the U.S. and Canada in 1947, *Sky Merchant* toured South America and then, in 1948, made a world tour, visiting nearly all the territories in the British Empire. Including the present tour, more than 80,000 miles have been flown. The company is satisfied that the "flying showroom" has made a major contribution to increased business.

LIVINGSTONE DELAYED

ORIGINALLY scheduled to open to traffic in November this year, Livingstone Airport (Northern Rhodesia), is not now likely to be ready until August, 1950. Difficulty has been experienced by the contractors with the bitumen runway-surfacing; before proceeding they are anxious to subject to the fullest possible bearing tests that portion of the main runway so far laid, in order to ensure that the completed runway will be perfectly safe for the large aircraft that will use it immediately it is opened.

Though expert advice—including that of the Air Ministry Directorate-General of Works, Nairobi—has been taken at every stage of construction, soft patches have appeared in the runway. Samples of stone and bitumen were immediately sent to London by air freight for scientific testing by the Road Research Laboratory of the Department of Scientific Research, who have recommended the addition of a chemical to improve adhesion between the two.

The area of bitumen already laid is about 40 per cent of the whole runway, at a cost of about £13,000, but some of this work may have to be replaced. Should it prove impossible to complete the laying before the onset of the next rainy season, it is considered unlikely that the main runway will be ready for use before August, 1950, although every effort will be made to complete it earlier. It is confidently expected that by that date construction of the airport buildings will have reached a stage that will permit full day-and-night operations.

HORIZON-BAR LIGHTS

MOST readers will by now be aware of the principle of the R.A.E. Horizon Bar approach-lighting system: in brief, there are three groups of lights per bar, the number of lights in the central group decreasing as the runway threshold is approached. Any individual bar in view may serve as an artificial horizon, and, since the overall length of the bars decreases towards the runway, a pilot flying so that all appear to be the same length as they pass under the nose of his aircraft knows that he is losing height at the correct rate.

A new light has been designed by The General Electric Co., Ltd., to take the sodium lamps used in installations of this type. A 140-W sodium lamp is mounted horizontally in front of a reflector of super-purity anodized aluminium, the assembly being clamped between cast alloy end-pieces. A Perspex panel in front of the lamp, and windows of the same material in the end pieces, ensure a wide horizontal spread of light.

BREVITIES

IN their first year of service with American Airlines, Convairs carried 1,032,000 passengers and flew 265,900,000 passenger-miles. American Airlines now provides Convair services to most of the 77 cities on the routes over which they fly.

* * *

B.C.P.A. has made arrangements with Trans-Canada Airlines to carry passengers from the United Kingdom to Australia or New Zealand via Canada at the same low fare (£260 sterling) as that for the route via the United States. T.C.A. will take passengers from London to Vancouver via Montreal, and B.C.P.A. will complete the journey from Vancouver to Sydney or Auckland. Stop-overs may be made anywhere *en route* without increase of fare.

* * *

In the new B.O.A.C. 21-seater Yorks (an interior view of one of which appears on the next page) additional modifications include double windows and new soundproofing throughout. There are a false ceiling, strip lighting, luggage racks and individual reading lights for passengers. Each aircraft has been equipped with an air-conditioning plant to add to the passenger-comfort whilst on the ground. Although the modified aircraft will carry three extra passengers, there will be no alteration in the all-up weight; freight payload will be only slightly reduced.

* * *

Weston Aircraft, Ltd., Oshawa, an associate company of the Hunting Aviation Group, has been appointed sole Canadian distributor for the new Hiller helicopter, manufactured at Palo Alto, California, by United Helicopters, Inc. The Hiller carries two passengers in addition to the pilot, and one distinctive feature is the self-centering overhead control stick with finger-tip control. The Hiller is expected to sell in Canada for just less than $25,000, plus the cost of spare parts and extra accessories.

* * *

The de Havilland factory at Witney Airfield, Minster Lovell, Oxfordshire, which has been occupied since 1940, was due to close on June 30th. The airfield was used as a repair depot for Hurricanes from May, 1941, and for Spitfires from March, 1942. During the latter part of the war, Rapides were built

Civil Aviation News . . . .

and repaired at Witney, and many Doves were overhauled there. Up to August, 1945, some 1,450 aircraft had passed through the depot. Since the end of the war, the Witney factory has been concerned mainly with work on Chipmunks, overhauls on Doves and a certain amount of repair work to Mosquitoes and Rapides. Mr. K. C. Brown, who was in charge, is now going to the Civil Repair Section at Leavesden, near Watford.

* * *

The M.C.A. has decided that since the Second-class Navigator's Licence is no longer a legal requirement, the holder of such a licence will not be required to maintain it in currency for the purpose of claiming exemption from the examinations for the new Pilot's Licences. Provided his licence was valid on March 31st, 1949, the holder may claim the appropriate exemption at any time up to the end of the conversion period, i.e., until June 30th, 1950. While there is thus no necessity, so far as United Kingdom licensing requirements are concerned, for "Second N's" to be renewed, they will, as hitherto, be renewed on application when necessary for flying in aircraft registered outside the U.K.

* * *

The Q.E.A. service between Sydney and Japan has, until recently, called at Manila, but aircraft on that service (in both directions) now land at a war-time airstrip on the Island of Labuan. No reason has been given, but the change may be connected with the wishes of the Philippine government in relation to their own Manila-Sydney service. Q.E.A. is now also flying a weekly Skymaster service between Sydney and Hong Kong, via Darwin and Labuan.

YORK REJUVENATED: It is probable that for some months after Canadair and Hermes aircraft have been introduced on routes to India and Africa, B.O.A.C. will continue York services to Cairo. Twelve Yorks have been converted to 21-seaters with the galley and toilet moved to the forward position.

FROM THE CLUBS

THE Association of British Aero Clubs recently drew up a resolution concerning the M.C.A. decision that no assistance could be given to the flying clubs. Although the resolution was submitted to the Air Ministry, the M.C.A. and the Admiralty on May 30th, there appears to have been no reaction other than an official acknowledgment from each department. The M.C.A. attitude had already been publicly made clear, but the A.B.A.C. memorandum was intended to draw attention to the serious situation among the clubs—one which threatens their existence and which might have a direct effect upon defence. As already indicated by the A.B.A.C. and by *Flight*, defence organization can be so closely linked with the maintenance of club and charter flying that at least some official reaction to the representations might be expected. It would be of great assistance to the flying clubs even to know whether the Air Ministry and the Admiralty were giving the matter further consideration, or whether their atittude is, in fact, similar to that of the M.C.A.

In the meantime, the clubs are carrying on as best they can, and in order further to integrate Service methods of training, the A.B.A.C. has drawn up standards for training equipment and for the maintenance of aircraft, and has recommended courses of study by which schools may become officially approved for training.

The *Instructor's Handbook*, Publication 1732A, has been adopted, and in it will be incorporated relevant sections from the new *Ground Training Manual*, which is reserved for Service use only and which is consequently not available to the public. The result will be a club manual incorporating a great deal of information which is essential to civil flying.

* * *

HERTS and Essex Aero Club report considerable activity at Broxbourne during the past month; some 350 hours have been flown with the Club's two Austers, two Tiger Moths, Hornet Moth and Proctor. Another Proctor which had been bought from the Ministry of Supply was given its C. of A. and has been sold to a member, Mr. L. C. Hazard. Four parties from Herts and Essex were due to fly to Deauville last week for the Air Rally, and three of them were flying on to Madrid for the Spanish Rally this week. The Club will be represented by two parties at the Rally to La Baule on July 16th.

A breakfast patrol has been organized for July 10th, when visitors are invited to attack Broxbourne airfield between 9.30 a.m. and 10 a.m. For those who successfully penetrate the defences there will be eggs and bacon "on the house." To the club with the greatest number of attacking aircraft in the field, Herts and Essex will award a special prize.

Curricula and a training syllabus have been submitted to the Ministry of Civil Aviation to qualify the Club as an approved training school. The application was, in fact, the first of the kind made, and Broxbourne was the first airfield to be visited by M.C.A. inspectors for the purpose of approval. There are already about 24 members flying with Student Pilot licences.

* * *

ACTIVITY at Shoreham has increased considerably during the recent fine weather, and many visitors have taken advantage of joy-riding facilities offered by the South Coast Flying Club. On Saturday, June 25th, nine members of the Midland Aero Club landed in four Austers and, after tea at the Club, were taken to the beach for a swim, returning later for supper; at 8 p.m. they were once again airborne for Elmdon. The Club offers a similar welcome to members of the R.A.F.V.R., many of whom are already frequent visitors to Shoreham.

GATWICK DISPLAY

ARRANGEMENTS are now well advanced for the *Daily Express* Air Pageant at Gatwick Airport on Saturday, July 23rd. The display, which is being organized with the co-operation of the Royal Aero Club, the Air League of the British Empire, and the Royal Air Forces Association, promises to provide plenty of novelty. The Royal Air Force will be represented on a scale equal to that of last year's Pageant and among foreign participants will be the Patrouille d'Etampes of the French Air Force; Miss Betty Skelton (described as "America's No. 1 air girl") and the prone-piloted ultra-light Weebee built by a group of Consolidated-Vultee engineers in their spare time.

Aircraft not taking part in the Display will not be allowed to land at Gatwick on July 23rd. Those who wish to fly to the area must make their own arrangements with the airport manager at Redhill or any other adjacent airfields, but so far as we are aware, there will be no arrangements for road transport from Redhill to Gatwick. A special enclosure will be shared by the Royal Aero Club and the Air League of the British Empire, in which full catering will be provided. Tickets may be obtained in advance from the Club at 5s per person, plus 2s 6d for each car.

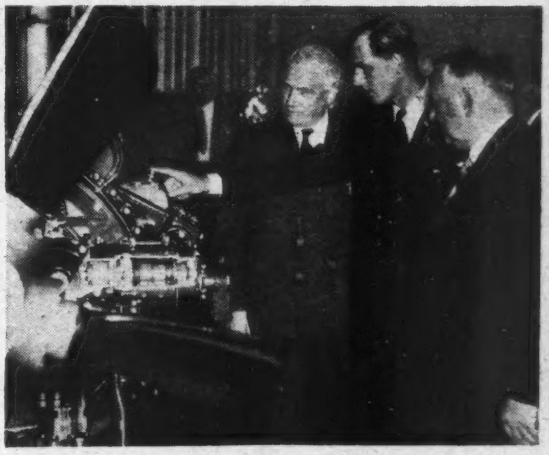
ROYAL VISIT TO ROLLS-ROYCE

Duke of Edinburgh Sees Latest Products of Derby Factory

THE Rolls-Royce organization at Derby was honoured last week by a visit from Their Royal Highnesses Princess Elizabeth and the Duke of Edinburgh. The Duke made an extensive tour of the works, and was later joined by the Princess in order to view the Battle of Britain Memorial Window which was unveiled last January in the main entrance-hall of the offices.

Several of the firm's directors were presented to the Duke on his arrival, including Mr. E. W. Hives (managing), Mr. A. G. Elliott (chief engineer), Mr. W. T. Gill (financial) and Dr. Llewellyn Smith (car division). The party then moved to the south-west factory gate, where Mr. H. J. Swift (general manager, aero production) met His Royal Highness and conducted him through the works, the main aisles of which were lined by the employees.

The Royal visitor showed the greatest interest in—and a keen understanding of—the piston engines and gas turbines (including Derwent V, Trent and Nene) which were on view both in completely assembled form and as components. During his tour he talked with a number of people, including one employee, Mr. R. F. Stone, who was awarded the Victoria Cross as an Army gunner in the 1914-18 war.



The Duke of Edinburgh examines the torch igniter on a Trent turboprop. This particular engine, incidentally, is shortly to be presented to the Science Museum as the world's first turboprop to fly.

The works tour ended with an inspection of the marine gas-turbine unit now being developed by Rolls-Royce for experimental installation in a motor gun-boat, H.M.S. *Grey Goose*. Returning to the main entrance the party then met Princess Elizabeth, and Their Royal Highnesses were conducted by Mr. Hives to the entrance hall in order to view the Memorial Window, the beauty and dignity of which clearly impressed them greatly.

THE NATIONAL AIR RACES

Minor Entry-list Changes : Organization to Cost £10,000

THE official entry list has now been issued by the R.Ae.C. for seven of the eight contests comprising the National Air Races (Elmdon Airport, Birmingham, July 29th-August 1st). The eighth race is reserved for R.Aux.A.F. pilots; brief details appear on page 7.

A study of the list of accepted entries for the R.Ae.C. events shows relatively few divergencies from the list of "applications for entry" given on page 772 of last week's issue of *Flight*. Only in the case of the Grosvenor Challenge Trophy is there any considerable change, an over-large number of applications—28—having been received; it has been decided to limit the entry to aircraft that are not eligible for the King's Cup Race and which have an all-up weight not exceeding 1,000 kg (2,205 lb). The decision has reduced the entry to a more manageable total of 17.

In this race, incidentally, the names of the two Czech pilots who are to fly the Sokol M.10 (Continental C.25) and Hodok Hk.1 (Walter Minor) are now announced: they are Karel Vanek and Bohuslav Douda respectively.

* * *

Only one addition is observable in the entry list for the King's Cup: the nomination of a pilot—T. W. Brook-Smith—to fly the Short Sealand amphibian entered by Rear-Admiral Slattery (who, of course, is managing director of Short Bros., Ltd.). Brook-Smith is also to fly the Short Sturgeon Mk. 1 entered for the Kemsley and Air League Trophies.

* * *

The 38 King's Cup entries are divided into three heats, of 12, 13 and 13 aircraft each. The R.Ae.C. is evidently making no concessions to superstition, for No. 13 has been retained as a racing number and allotted to one of the two Mosscrafts entered by W. H. Moss.

* * *

Competitors, incidentally, retain the same numbers throughout the meeting, irrespective of whether they are competing in one or several races. Numbers run from 1 (A. L. Cole's Comper Swift) to 91 (the Hawker P.1052 to be flown by "Wimpey" Wade).

* * *

In the Kemsley Trophy—one of the three higher-speed events—J. W. Morgan has been nominated as pilot of the Spitfire two-seater trainer.

In the same event, the D.H. Hornet announced in the original list as a Mk. 20, now appears as a Mk. 22, which, actually, is a Sea Hornet, a single-seater reconnaissance version of the Sea Hornet 20. R. W. Jamieson will also fly it in the Air League Trophy.

* * *

The entry of thirteen (that number again!) clubs for the Siddeley Challenge Trophy is completed, as compared with the original list, by the nomination of three previously unspecified pilots—A. H Williams (Tiger Moth) for Cardiff, R. G. Evans (Taylorcraft) for Yorkshire and K. B. Lalonde (Auster Autocrat) for Bristol and Wessex.

* * *

Additional entries in the Norton Griffiths Challenge Trophy are L. W. Hamp (Miles Messenger) and S/L. Rush (Miles Falcon), and a pilot for the Czechoslovakian entry (Kovo, Ltd.) of an Aero 45 in the person of Jan Andrle. One of the two French pilots of the Nord Norécrins, F. Duperré, was the winner of the recent Grand Prix de Meaux in France, reported on page 27.

The Kemsley Challenge Trophy (left) and the Siddeley Challenge Trophy. The other trophies were illustrated last week.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

CHARTER OPERATORS

—and Continental Competition: The Ministry of Civil Aviation Criticized

A RECENT paragraph in *The Daily Telegraph* regarding difficulties experienced in regard to charter aircraft to Australia illustrates just one angle of the difficulties extant in air charter to-day.

The infamous Section 23 of the Civil Aviation Act does tend to stifle all possible activity by British charter operators, its ambiguity usually resulting in that the Ministry of Civil Aviation can do no wrong and the charter operator can do no right. The continual hampering of charter operators, both British and Commonwealth, by the M.C.A. is another example of bureaucracy. For instance, recently I arranged the charter of a South African registered aircraft to carry live stock from the U.K. to Nairobi only to be informed by the U.K. Agent for the operator, about 14 hours before departure, that the M.C.A. had stated that such an operation was cabotage and thus not permissible. I understand the actual phraseology used by the M.C.A. representative was that he "was not going to play ball."

This atttitude might be laudable if it was the intention of the M.C.A. to protect British charter operators, but the Continental airlines are gaily allowed to operate charter flights within the Commonwealth without hindrance, so long as they technically position to their home base *en route*. British operators find themselves being undercut, not so much by operations at "cut-throat" prices, although they are a bit near the mark, but by virtue of the fact that the Continental airlines quote on a one-way basis, and, on paper, absorb the backflight into their normal airline activities; whilst the British operator, being unable to find backfreights, must quote on a round-trip basis and thus find himself outbid every time.

London, S.W. J. P. G.

DECK LANDING

Changes of Technique brought about by the Tricycle Undercarriage

I EXPECT the excellent article in *Flight* of June 16th, comparing British and American methods of deck-landing, has aroused a good deal of interest amongst old and new Naval pilots: Though I think the author has put his points simply and clearly, I consider he has missed an important aspect of deck-landing which has only recently received any serious thought in this country. It is what I would like to call "tricycle technique," and the differences this sort of undercarriage has made in the art of deck-landing.

Before tricycle undercarriages were used in Naval aircraft, the approach speed was necessarily very near the stall, perhaps dangerously near it, say, 1.05 Vs (Vs = stall speed, engine off). The reason why the pilot was obliged to execute this remarkable feat every time he wished to deck-land was merely because the aircraft was designed to land on three points only at speed (and therefore attitudes) at, or nearly at, the stall. If he lands faster (say, 1.1 Vs), he will be in a sufficiently nose-down attitude to hit main-wheels-first, and as the c.g. is aft of the main wheels, the tail will continue to descend and *increase* the aircraft's incidence. The heavier the bounce, the more sudden the increase in incidence. This would increase the lift on touch-down sufficiently to cause the next contact with the deck to be in the barrier! The Americans were quick to realize that pilots would nearly always prefer an approach speed of 1.15 Vs to one of 1.05 Vs; and accordingly lengthened the tail-wheels of their aircraft, so that, in a landing at 1.15 Vs, the incidence would not increase on landing, and the ability of the aircraft to stay down was purely the ability of the undercarriage to absorb the vertical velocity without rebound. The arrestor hook was also lengthened far more than in English aircraft, which ironed out yet another pilot error, i.e., height adjustment.

Now, if some bright person were to suggest a way of *decreasing* incidence (or lift), on touch-down, he would doubtless think of lengthening the tailwheel out of all proportion (and thus ruin the take-off performance); or, if he thought a little more, he would suggest the tricycle undercarriage. And this is the point. Tricycle aircraft have their c.g. forward of the main landing wheels, and therefore, if a sufficiently heavy landing is made on these wheels, the aircraft will lurch forward on to the nosewheel and, most obligingly, decrease incidence. Provided no nose-wheel-first landings are made, no bounce will occur, even with touch-down speeds of 1.3 Vs, as there is not sufficient incidence (lift) to do this if the pilot takes care not to raise the nosewheel off the deck again. The approach speed would therefore be limited only for structural reasons (carrier and aircraft!).

Thus, with the advent of the tricycle undercarriage, the large amount of training required to ensure a fair measure of success in deck-landing is probably reduced, as it is obviously easier to approach at 1.2 Vs and below than at 1.05 Vs and below. At a speed of 1.2 Vs, the height adjustments on the approach are made by the obvious control to use—i.e., the elevator. No juggling with the throttle is required, merely a preconceived constant power setting to give the required rate of descent, or "no descent," depending on which approach system is used.

The tricycle undercarriage is a great boon to the Naval pilot, particularly with the jet-engined deck lander, where problems of accurate speed control on the approach are so much increased. The American standard approach is to be heartily recommended for all tricycle-jets, though I doubt whether it would be as suitable for our conventionally undercarriaged aircraft.

Belfast. MICHAEL CROSLEY.

A NATIONAL AERONAUTICAL MUSEUM?

Views of a Private Collector

I HAVE been most interested in the correspondence relating to a Museum of Early Aviation and Historical Documents which has been published in *Flight* during recent weeks, more especially as for over 20 years I have had such a scheme in mind and to this end have been steadily collecting from Europe and America as many interesting items as possible with the eventual intention of presenting the whole for inspection by the public.

Although many items and machines have been presented to the collection, a private individual without official backing has on many occasions to consider the most suitable item to purchase out of several offered, and it grieves me to think of the number of historically interesting aviation and automobile relics which could not be purchased and which eventually were destroyed or lost by their owners, mainly through the recent war years.

I have visualized a museum exhibition showing the development of mechanical transport on land and air and I have taken the period 1800 to 1918 as showing the greatest development, as one has to draw the line somewhere. Official backing for such a project would permit suitable large buildings with the necessary space to house interesting aircraft up to the present day, but this is beyond the scope of collecting on a private scale.

My 20 years of search have so far resulted in over 100 actual original specimens of bicycles, automobiles and aircraft (and, in addition, numerous accessories, relics and parts) being included in my museum. To this must be added a library section with books, periodicals, catalogues, plans, etc. Several additional aircraft and automobiles have been promised as soon as they can be housed in a suitable building.

It is interesting to consider that with some reasonable official assistance well over 100 bicycles and tricycles, 180 automobiles and 35 aircraft, all built between 1800 and 1919, would now be available for public inspection. Many of these are still offered when they can be suitably housed; the remainder have been lost during the recent war.

I believe a section to include only items on loan from their owners would prove of very considerable interest, as there must be considerable material in this country which has some sentimental value attached to it by the owners, who would, however, gladly loan it to such a project, and I have been considering eventually adding such a section.

It must be realized that without official assistance, whether from Government or county or local authorities, the difficulties to be overcome are immense, and I have been attempting for several years to find a formula which is acceptable to town and country planning, county and local authorities on a number of sites, and my enthusiasm and optimism are still as great as ever.

Correspondence . . . . .

Whilst writing I might mention that some little time ago I wrote you concerning your visit to the Fokker works in Holland and I asked if you had any information on Fokker D VII aircraft, other than the one in my museum and the one used in the American film *Hell's Angels*, or if your readers had any knowledge of other machines of this type. Parts of this letter you published and I would like to thank those of your readers who so kindly wrote on the subject. It would appear as a result, and also as a result of my own enquiries, that no other complete example exists at the present time. I would like to mention that I obtained very complete details of the history of my own D VII from the German Air Ministry prior to the war, and also from a French source.

Weybridge, Surrey. R. G. J. NASH.

"WATER WITH IT"

An Explanation from One Who Should Know

YOUR correspondent "Flying-Boat Flying Instructor," in his letter to *Flight* of June 16th, on the influence of tide on the take-off of a flying-boat has resorted to a most ingenious and complicated explanation of what surely is a very simple matter. Assuming that the tide is regular in direction and velocity, and insufficiently fast to make the water really turbulent, it will have no effect whatever on take-off time or on distance measured along the water. It is wind speed relative to the water which makes the apparent difference.

As Mr. Barrie Aldbury implies (*Flight*, May 19th) the aircraft has no means of judging as between a 7-kt tide in a calm and a 7-kt wind in still water. The distance required to take-off *as measured from the shore* will vary by an amount equal to the distance the water moves during the period of the take-off.

The influence of wind on the take-off is a much more complicated matter, and here I think "Flying Instructor's" explanations helpful. A landplane follows a relatively simple law, but it is one which the flying-boat does not necessarily obey. The attitude (incidence) of an aircraft when taxying is independent of ground speed, and so is drag, except possibly for some slight change in wheel-rolling friction; it is air speed that counts. A flying-boat hull, however, to support its share of the weight—the gross weight less the wing lift—will be dependent to some extent on water speed. The less the speed the greater the depth of run. This in turn may affect the drag and will, almost certainly alter the attitude, which again affects the drag. Thus, if the water speed is very different from the air speed, as when taking-off in a wind, both the resistance and the attitude may be appreciably changed from those met with in a calm.

A modern flying-boat, i.e., one with the steps placed well apart, has a streng tendency to run at its natural attitude on which the pilot cannot exert much influence, at least without causing a loss of stability. If the designer has been really clever this angle will vary with speed, weight, position of c.g. and so on in the most perfect way. This quality is perhaps the one in which the boat differs most from the normal aircraft in which the pilot has control over the attitude on the ground so soon as the elevators become effective.

To take off, any form of seaplane has not only to accelerate to the appropriate speed, but also to climb a height equal to the depth of its displacement at rest—some five feet in a Sunderland.

In practice I have found that a properly designed flying-boat does get off quicker into wind but I have, in the earlier days, had experience with underpowered seaplanes which would only get off at all down-wind. J. LANKESTER PARKER.

Shorne, Kent.

"KITE-SITTING"

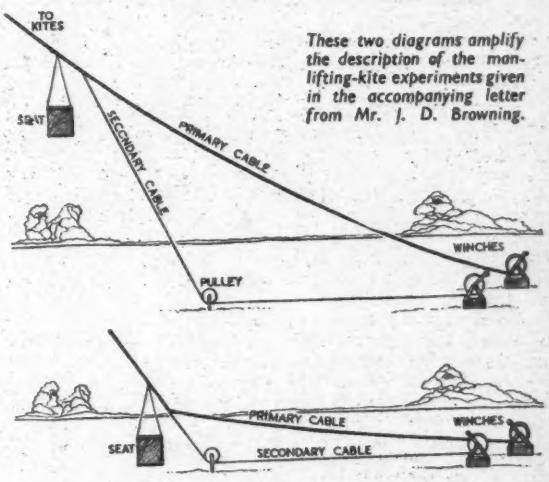
Another Boyhood Recollection: Airborne by Three Box-kites

I WAS very interested in Mr. R. Hadekel's letter on "Kite-Sitting," in *Flight* of May 26th, for way back in 1911 I was one of a small group of youngsters watching with great interest a Mr. Brogden flying three of his man-lifting kites on Duppas Hill, Croydon, within a mile of the site of the present airport.

It was a great thrill to be asked by him if I would like a "lift," and with a greater one I accepted. I sat on a seat similar to the sort used by children on garden-swings, and was soon borne aloft some 50 feet with legs danging, and hands gripping the seat-ropes, which were fixed to the main cable.

Short cables from three large box-kites were fixed to a main cable attached to a "primary" winch. About 100 feet up this cable—from the winch end—was attached another cable (see sketch) which was secured to a secondary winch through a pulley-block some way forward of the two winches. The main cable had an appreciable "sag," and it was at this "sag" that the necessary "lift" was obtained. At the point of the two cables joining, the seat was secured. The kites were some 1,500ft above.

The secondary winch hauled the main cable down to the



These two diagrams amplify the description of the man-lifting-kite experiments given in the accompanying letter from Mr. J. D. Browning.

ground, the passenger got into the seat and by slowly "winching-out" the secondary cable, the main cable took up its original line, by this means lifting the passenger upwards.

One very necessary precaution to be taken was not to indulge in this aerial sport if thunder clouds were about, as "static" is very easily picked up on metal cables. No doubt it would be possible to design and build very efficient weight-lifting kites in the light of present aerodynamical knowledge, and these is no reason why this very pleasant pastime should not be revived—as a contrast to flying in some of the present-day contraptions of mechanical ironmongery and plumbing which pass as powered aircraft. J. D. BROWNING.

Croydon, Surrey.

FORTHCOMING EVENTS

July 4th to 11th.—Royal Aero Club: Private Air Rally to Spain.
July 9th.—Royal Naval Air Station, Culham, Oxford: Air Display.
July 9th.—Redhill Flying Club: Garden Party.
July 10th.—Auster Flying Club: Air Display at Rearsby Airfield.
July 16th.—Royal Naval Air Station, Anthorn, Kirkbridge, Carlisle: Navy Day.
July 16th and 17th.—Royal Aero Club: Private Air Rally at La Baule, St Nazaire. Guests of Mme. André.
July 17th.—Cowes Aero Club: Air Display.
July 20th—Aircraft Golfing Society: Mid-week Competition, East Brighton.
July 23rd.—"Daily Express" Air Pageant, Gatwick Airport.
July 30th to Aug. 1st.—King's Cup Race and National Air Races, Elmdon Airport, Birmingham.
Aug. 6th.—Southend Flying School: Flying Meeting and Air Display.
Aug. 19th to 26th.—British Gliding Association: National Gliding Contests Gt. Hucklow, Derbyshire.
Aug. 21st.—Wiltshire Flying Club and Royal Artillery Flying Club Thruxton Air Races.
Aug. 28th.—Cowes Aero Club: Air Display.
Sept. 6th to 8th.—R.A.F. Golfing Society: Autumn Meeting and Ladies' Section Championship at Wilton Heath Golf Club.
Sept. 7th to 11th.—S.B.A.C. Annual Flying Display and Exhibition Farnborough.
Sept. 7th.—R.Ae.S. (Luton): "Air Liner Operation."
Sept. 12th to 18th.—Battle of Britain Week. R.A.F. "At Home" day Sept. 17th.
Sept. 14th.—Inter-Services Swimming Championships, Seymour Hall, Marylebone, London.
Oct. 5th—R.Ae.S. (Luton): Film Show.
Nov. 2nd.—R.Ae.S. (Luton): "Gas Turbine Development."
Nov. 23rd.—R.Ae.S. (Luton): "Brains Trust."
Dec. 7th.—R.Ae.S. (Luton): "Role of Aircraft in Future Warfare." Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.

AMERICAN NOTEBOOK

By "Favonius"

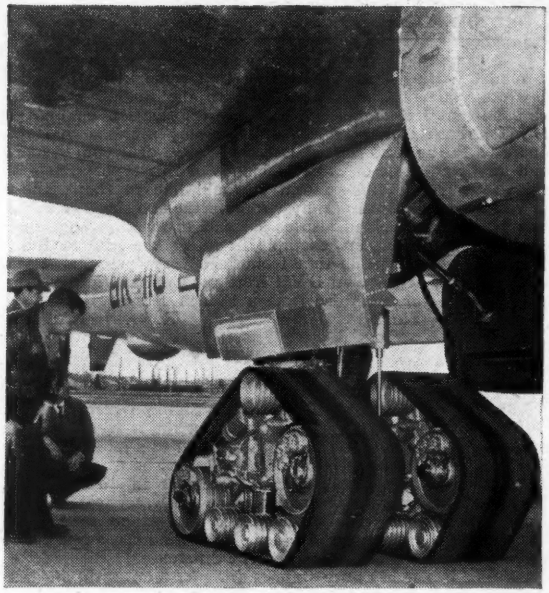
SOME CATERPILLARS FLY—

DESCRIBING it as "the world's first track-tread type landing gear for medium or heavy bombers," Boeing announce successful completion of taxi tests with a caterpillar-track landing gear fitted to a B-50 weighing 164,000 lb. This fanciful claim will be news (or stale bread upon the waters) to George Dowty, who pioneered the introduction of caterpillar gears for aircraft, both in England and the U.S.A., before and during the war, and even got as far up the weight scale as a caterpillar landing gear for a Lancaster bomber.

The B-50 gear follows, in fact, along the lines established by Dowty on an experimental Douglas A-20 attack bomber and since more fully exploited in America by Fairchild in collaboration with Firestone on the Fairchild C-82 Packet Transport. Grooved and wire-reinforced rubber belts running over grooved drums and bogies, with multiple shock-absorber units, permit the gear to roll with ease over small obstructions and turf or dirt—that is, the kind of unpaved runway that would quickly bog the modern bomber with high wheel-loadings.

There is more truth in Boeing's claim that the B-50 gear is the largest of this type so far built. The main gear comprises a twin-track installation in lieu of the twin-wheel system of the standard B-50. These endless belts are each 20in wide with a ground contact length of 46 in; i.e., a total contact area of roughly 13 sq ft is available per side of the aircraft. The nose gear, which retains the hydraulic steering feature of the standard nose wheel, is a single-track unit measuring 16in wide by 36in long—a contact area of 4 sq ft. All three caterpillar units are fully retractable, thus the speed performance of the aircraft is unchanged.

Since the total "footprint" area of 30 sq ft is about three times that of the standard B-50 double-tyre system, it becomes possible to operate from a greater number and variety of improvised bases. Considerable misconception is prevalent in England concerning the proper sphere and functions of aircraft equipped with caterpillar landing gears, for it should be understood that they are not primarily intended for hard runways. One official apologist for the *status quo* has publicly stated that the use of track undercarriages is not worth while—presumably because the engineering snags are difficult to hurdle. Meanwhile the Americans have got their caterpillars out of the cocoon stage and into the air.

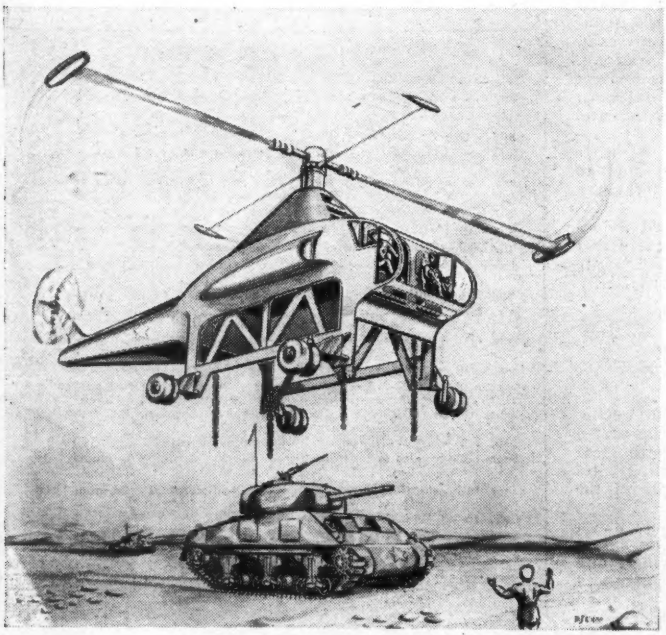


An experimental twin caterpillar landing gear for the Boeing B-50 Superfort. (The corresponding nose gear was illustrated in "Flight," June 2nd). The main units and belts were manufactured by Goodyear, and the nose unit by Firestone. Ground "footprint" area is roughly three times that of standard B-50 wheel-and-tyre system.

— AND SO DO CRANES

A GIANT twin-jet, heavy-lift helicopter is under construction (or, at any rate, design development) for the U.S.A.F. at the Culver City (Calif.) plant of Howard Hughes. As the sketch illustration shows, it is designed as an aerial crane to pick up tanks, field artillery and suchlike heavy military equipment in much the same manner as the grotesque mechanical monsters used in the lumber industry, which straddle over a stack of boards and hoist the load between their high vertical sides. The Hughes XH-17 will settle down like a clucking hen over her eggs and, after the cargo is hooked in place, will lift it over short hauls.

The 136-ft diameter rotor is jet-reaction-rotated through ducts leading up the rotor shaft and out through burners (or ramjets) at the blade tips, the thrust being supplied by a pair of Allison J-35 turbojets mounted along the vertical sides of the cargo hoist. Reports indi-



An artist's conception of the Hughes XH-17 jet reaction helicopter for the U.S.A.F. Its military function is to pick up tanks, artillery, etc., and transport them over short hauls. Power plant is two Allison J-35 turbojets driving a 136-ft rotor by jet reaction through ramjets at the blade tips.

cate that not all of the available jet thrust will be applied at the blade tips, but that part of it will be delivered back into the compressors. Since the forward speed is bound to be very low, one might expect that the propulsive efficiency of the turbojets would be correspondingly low. A figure of 4,000 h.p. has been quoted as the equivalent power from the jet engines, but this estimate strikes us as cheerfully optimistic.

Moreover, as helicopter non-experts, we are frankly puzzled at the installation of a conventional torque-compensating rotor at the tail, since it is our understanding that jet-rotated rotors are not guilty of this particular malfeasance; in fact, the eliminating of this lethal weapon at the back has always struck us as the clinching argument for jetted rotor blades over those of the more orthodox Sikorsky type. It is possible, of course, that the XH-17 will eventually shed its tail rotor (legitimately, we mean!) after the initial flight-tests.

The local helicopter experts tell us that this latest brainchild of Howard Hughes will gross about 40,000 lb, based on the aforesaid 4,000 h.p. and a conservative loading of 10 lb/h.p. About half of this gross weight would comprise the load, which means a pay-lift of 20,000 lb of cargo, or some 100 persons—assuming that the latter have no objection to sitting on the end of a crane hook!

WASHING-TOWN

SPARKED by U.S. Navy proponents in Congress, a pungent political storm is brewing in the Washington punch-bowl. This is the Navy's return punch for the infanticide recently committed by Defence Secretary Louis (Herod) Johnson on the Navy's super-carrier—slain in the dockyard bulrushes when only a week or so old. The House Armed Services Committee has voted a searching investigation into all phases of the B-36 bomber—calling for all the facts relating to when, why, and how it was purchased, including any cancellations of other aircraft procurement that may have resulted.

Apart altogether from the technical aspects of the controversy (a subject to which this writer has already devoted considerable space and slide-ruling) the procurement history of the B-36 is reminiscent of the old dandelion game—"she loves me, she loves me not" sort of thing. Thus in 1947, Convair held contracts for 100 B-36s, although at the time there was considerable doubt in the aircraft industry as to whether the full contract would ever be validated. Early in 1948, after Air Force studies indicated that the B-36 was not suitable, it was actually planned to cut the contract back to 50 or 60. At that time, incidentally, Mr. Louis Johnson was a director and attorney for Consolidated-Vultee.

By September of 1948, however, it was announced that the B-36 contract would not be cut back after all, but that the entire 94, still under contract, would be accepted. In October, the production of Northrop B-49A jet bombers was transferred from Northrop to Convair, but a little later this decision was reversed and the B-49 contract was cancelled. About this time, further cut-backs of other types involving over $300 million were announced. Most of this has now gone to Convair for additional B-36 bombers and modifications to the earlier B-36A series. One enlightening statement in Congress was that the current B-36D costs approximately $4.7 million, of which some $2.5 million represents modification costs in an attempt to bring it more in line with current jet developments.

The central figure in this gigantic linen-wash, of course, is multi-millionaire company promoter Floyd Odlum, who acquired control of Consolidated late in 1948. The linen about to be wrung through the Congressional mangle is only a small part of Uncle Sam's military shirt, but nevertheless the American taxpayer who is paying for it is entitled to have a closer look at the bill.

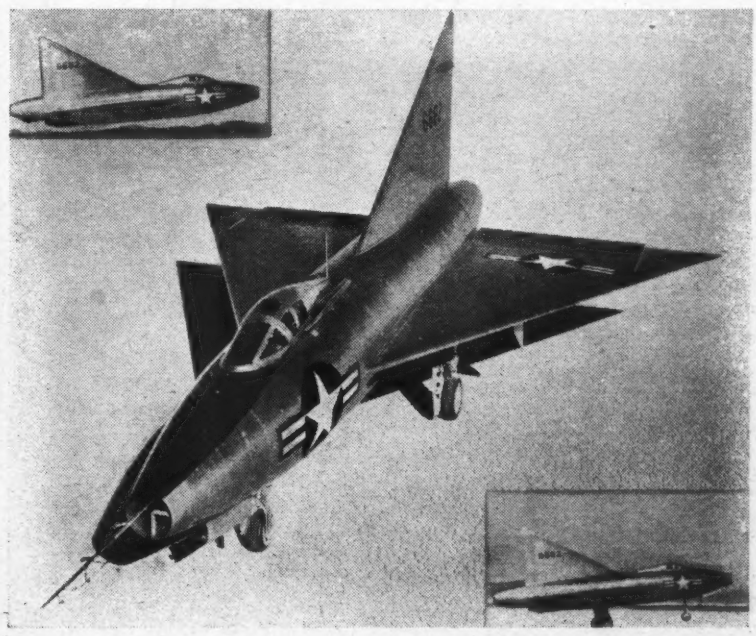
TRIANGULAR TRANSONICS

PREVIOUSLY illustrated in the March 3rd issue of *Flight* (p. 245), the Convair Model 7002 transonic delta-wing research project has now been officially accepted by the U.S.A.F. and designated the XF-92A. It was built to obtain flight data on triangular-shaped wings of very thin section, and a series of flight tests has already been successfully run at the Muroc Air Force Base. This particular model is intended as a flying mock-up for preliminary stability and control data, rather than for immediate application to transonic speed research.

Originally schemed as a supersonic jet-rocket fighter, the XF-92A is currently powered with an Allison J-33 radial-compressor turbojet, wet-boosted to 5,200 lb s.t. and aspirated via a single nose-duct bifurcated around the pilot's cockpit. In place of the original rocket-motor installation, the fuselage now shows evidence of provision for an afterburner, although it is not known at this time whether it has actually flown with this form of ramjet thrust augmentation.

The design gross weight is approximately 13,000 lb, albeit with a very short fuel supply—reported to be only about 30 minutes—since all the fuel must be carried in the fuselage. Approximate overall dimensions are: span 31ft, length 41ft, and height 18ft. Wing leading-edge sweep-angle is 60 degrees, which results in a gross wing area (including body) of about 380 sq ft and an overall aspect ratio of 2.5; excluding the body section, the net wing area is approximately 285 sq ft and the corresponding aspect ratio 2.75.

Unlike the inverse wing-taper of the Republic XF-91, the triangular planform wing offers a logical aerodynamic and aero-elastic solution to flight at transonic speeds. The combination of acutely sweptback leading edge, straight trailing edge and extremely



The Convair Model 7002 has been re-designated XF-92A. The prototype is being used for stability and control research and for building up full-scale know-how on delta-wing configurations. The big problem is the high wing-angle for take-off and landing.

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low aspect ratio permits a very stiff torsion structure and the use of a very thin wing-section. The thin section plus the large sweep angle are two of the chief ingredients for raising the crust of the Mach pie, thereby delaying the drag rise over the transonic hump.

Structurally, the triangulated wing-spar layout is far superior to ordinary sweptback ladder-type structures, since the rear spar mounting the elevator-cum-ailerons can be made straight (i.e., zero sweep angle) and adequately stiff to meet the aileron torsion loads without serious change of wing incidence and consequent loss of control through aileron reversal. Moreover, in view of the low aspect ratio and elimination of the usual tail structure, the structural weight efficiency is bound to be high, despite the very low thickness/chord ratio of the wing; in other words, the actual structural depth of the wing spars is by no means shallow.

All the same, there are plenty of unsolved aerodynamic and mechanical problems awaiting further research, and it is this fact, rather than any near-at-hand military application, which makes Convair's XF-92A significant to the design engineer. Although the delta wing has the desirable wing-tip control qualities of low-aspect-ratio wings in general, it also presents a similar high stalling angle as a result of the flat slope of the lift curve. Unless, therefore, future military pilots are trained to take-off and land on their tail-pipes with the technique of a scalded cat, our bright young designers will have to get busy with a new type of variable-incidence wing.

Apropos which we will horrify the orthodoxists by suggesting with tongue in cheek (but with pencil poised should someone call our bluff) that the new type variable-incidence wing should vary the fuselage datum by rotation of the fuselage nose section, rather than by rotation of the wing on the rear fuselage. The main idea is to bend the fuselage by lowering the nose section containing the pressure cockpit and the nosewheel. This arrangement also presents a novel thrust solution in the event of a baulked landing. But that is another story for another time—after we have conferred with our pet patent agent!

CORPULENT CONNIE

ANYONE driving past the Lockheed Air Terminal, Burbank, California, during the past few weeks might have noted a grotesque-looking Constellation sitting out in the sun slowly growing a couple of enormous humps midway along the top and bottom of the fuselage, plus a row of masts like a clothes-line from cockpit to tail. Rumoured functions regarding this public display of a hush-hush naval project have varied from an admiral's battle eyrie to the more prosaic purpose of radar scanning for off-shore warning of enemy approach prior to coastal radar detection. In any case, it was no secret that the matronly Connie [illustrated in *Flight*, p. 759, last week—Ed.] was packed with highly specialized radar equipment.

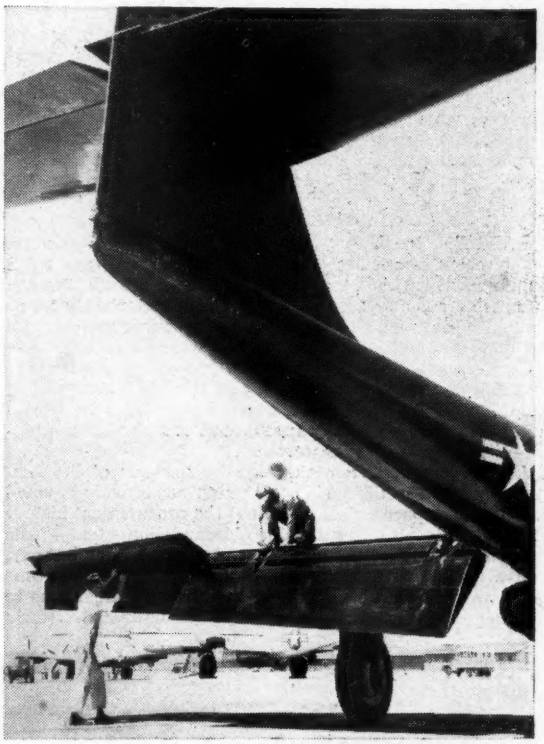
Designated the Lockheed PO-1W, this Doge's Palace of the New World has now been test-flown for a couple of hours and officially revealed by the U.S. Navy as a modified version of the commercial type 749 Constellation rigged up for the testing of airborne electronic devices. The fuselage humps are radomes, while, of course, the dorsal spikes are radio antennae. The standard Connie nose has also been through the engineering powder-room for a bit of make-up and now emerges with a slightly elongated nose-bag for the installation of radar equipment.

Normal flight-crews are carried, including pilot, co-pilot, flight engineer and radio operator. In addition, facilities are provided for technicians and electronic-equipment operators. Bunks are also installed for relief crew members on long flights. Lockheed engineers, incidentally, claim that all these bulky external impedimenta do not materially affect the air performance—which is tantamount to saying that the air particles step smartly aside without getting themselves bruised. It must be that balmy California air!

PELICAN FLAPPERY

NORTHROP design ingenuity is frequently matched by a corresponding philological fertility in coining a new terminology to describe their own unconventional engineering. Thus, following the term "elevon" to describe the combination of elevator and aileron used on all-wing aircraft, we are now being introduced to wing "decelerons," which combine the functions of ailerons, air brakes and landing flaps. This deceleron scheme, now employed on the Northrop XF-89 Scorpion all-weather fighter, is an alternative approach to the full-span flap seen earlier in the Northrop F-61 Black Widow night fighter.

Decelerons comprise essentially a double split-flap combination over the outer half of the wing span, arranged mechanically to function as ailerons either in the closed or



Tagged as "decelerons" by Northrop, the outer flaps are designed to operate as ailerons, landing flaps and dive brakes. They are here shown fitted to the Northrop XF-89 Scorpion two-seater all-weather fighter. Inner flaps are double-slotted type.

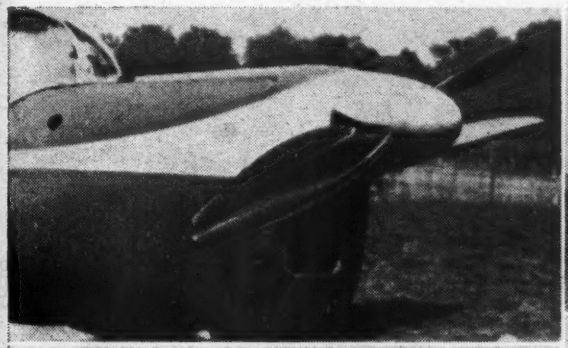
open position of the flap jaws. Perhaps the simplest way to describe the arrangement is to liken these flaps to the head and beak of a mythical pelican (probably closely related to the R.F.C.'s infamous wallah-wallah bird), which can fly equally well with its beak closed or wide open. It can also rotate its head up and down as a whole to vary the pitch or incidence of the combination. In the latter condition, however, one must stretch the pelican analogy a bit and imagine that our legendary bird has a couple of heads which can move differentially with respect to each other to produce the requisite rolling moment for the aileron action.

In the normal flight attitude the flap jaws are closed and the general lie of the beak is down-wind at zero incidence. (Our mythical twin-headed *pelecanus*, like the wallah-wallah, belongs to the ascender group, which is noted for flying backwards.) In this configuration the twin heads with closed beaks are rotated differentially just like conventional ailerons; in fact, since the flap jaws are closed to-

gether, the external appearance would be indistinguishable from ordinary ailerons. In the take-off condition, the beaks also remain closed (for low drag), but the twin heads are drooped about 30 degrees (for extra lift), while the aileron movement is essentially the same as that for normal flight: i.e., the twin heads rotate in opposite pitch.

For decelerated flight attitudes there are two configurations of the head, one for landing and the other for dive- or speed-braking. In both of these conditions, the two beaks are fully open and the individual heads as a whole are differentially rotated for aileron action. In the landing configuration the two heads are trailing down around 60 degrees (for maximum lift and high drag), while in the air-brake regime the heads lie at zero incidence with the beaks wide open (for low lift and maximum drag). The inner half of the wing span, by the way, employs a double-slotted lift flap—which seems to indicate that this strange bird has some Cricklewood feathers.

Two possible question-marks occur to mind. Why this new approach to full-span flappery in place of the earlier Northrop scheme employing the retractable ailerons of the F-61 and the C-125 assault transport? And how do Northrop aerodynamicists get over the well-known hurdle of control heaviness with drooped, hinged-plate-type ailerons? The answer to the first query is that the 9 per cent wing thickness of the Scorpion precluded the installation of retractable ailerons, while aileron loads are met by a power-boost system. Northrop, of course, has an established reputation for flap experimentation and this latest one is worth watching.



(Top left). A novel slotted airscrew—virtually two blades overlapping each other on each side—was fitted on one of the Norécrins. (Top right). This special Norécrin, with clipped wings and Renault engine, took third place. (Bottom left). Marcel Doret's 20-year-old Dewoitine D-27 fighter. (Bottom right). Older still—a veteran Caudron biplane demonstrated at the display.

RACING IN FRANCE

—and Some Demonstrations, Ancient and Modern

AT the second post-war Grand Prix de Meaux race meeting, held recently at Meaux airfield, near Paris, the entry for the main event consisted almost entirely of Nord Norécrins, the sole exception being the prototype Lignel Coach. Other entrants, such as the Ryan Navion and the Gerchais-Roche T-35, failed to qualify in the eliminations held during the morning. The winner was M. Duperré, of the S.N.C.A.N., in his special Norécrin powered by a "hotted-up" Regnier 4LO engine giving some 180 h.p. This pilot (who is to compete in the British National Air Races) and aircraft also won last year's race. Second place was taken by M. Depré, also of S.N.C.A.N., in another Norécrin, and the third place went to M. Desmoulin, owner of Meaux airfield, who was flying a Renault-powered Norécrin with clipped wings. The aircraft is illustrated above.

The Swiss-owned Nordi N.315, only remaining aircraft of its type in existence, powered by a 260 h.p. Hirth H.M.508C and piloted by Signor Rosaspina, was considered a hot favourite. Owing to a series of mishaps it did not arrive at Meaux in time for the eliminations. The authorities, however, decided to allow the pilot to start provided he completed the elimination circuits; but during the second circuit, while the Nardi was flying at some 350 km/hr, the front cockpit canopy blew open and folded back, injuring the co-pilot and damaging the fuselage fabric. The aircraft had to be scratched from the race.

The main event was followed by an excellent display of aerobatics given by M. Noetteghem in a Stampe S.V.4—only slightly marred by the behaviour of his engine, which was missing badly. A further aerobatic display was provided by the well-known pilot M. Doret, flying his 20-year-old Dewoitine D-27 fighter. An ancient Caudron G-3, *circa* 1914, then took off to show its paces and, whilst it was in the air, a Centre NC.1071 twin-Nene experimental Naval trainer arrived over the airfield to give a display in high-speed contrast.

The show was wound up with an acrobatic act on the wing of a Morane 502 in true pre-war style by M. Roland Toutain (the highlight of the act was his hanging by one foot from the underside of the Morane and picking up flags from the ground), and some parachute jumping by students of the French Parachute School.

V. G.

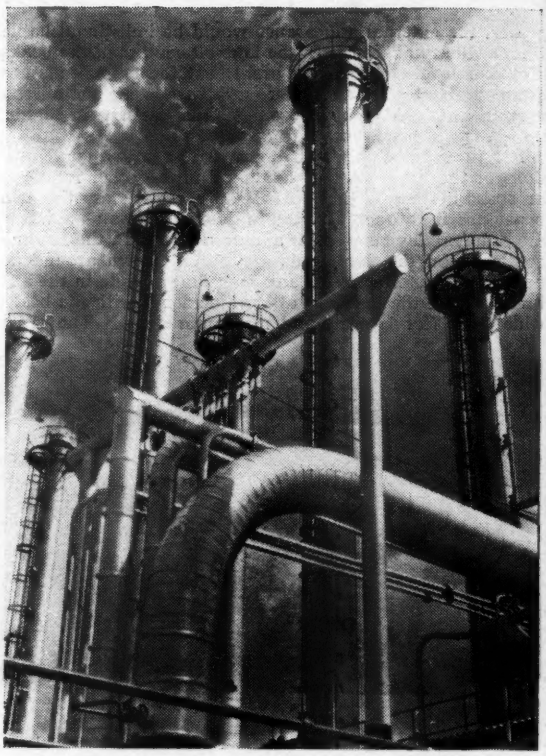
SOLVENTS BY SHELL

Industrial Chemicals from a Vast New British Plant

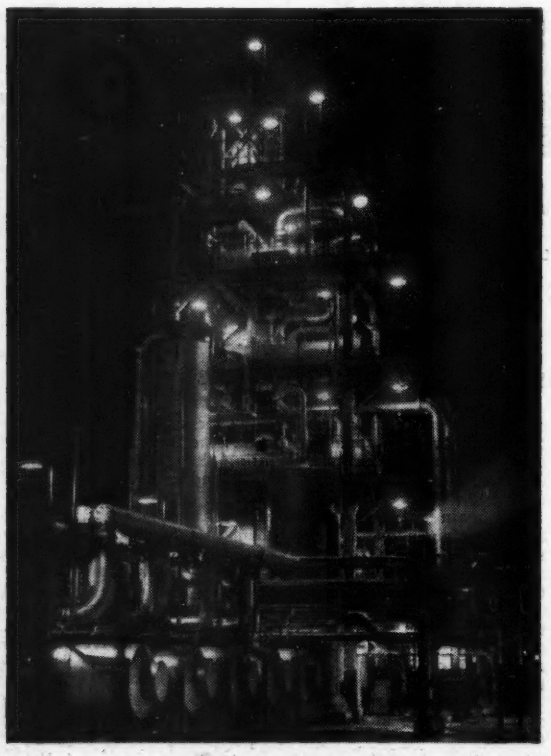
ALTHOUGH on first consideration the production and use of petroleum-based chemicals may appear to have little connection with the aviation industry, these products are, in fact, of considerable basic importance to the manufacturer, in this sphere as in many others. Among the most valuable of these chemicals—many of which hitherto have been produced only from coal—are those used as (or in the preparation of) industrial solvents. These solvents include acetone, extensively used in the production of nitro-cellulose lacquers and aircraft dopes and also in the manufacture of certain plastics. Another solvent, diacetone alcohol, is likewise used in lacquers, and has another particularly valuable application, namely, as an ingredient of hydraulic fluids.

Up to now, as we have indicated, most British organic chemicals have been processed by distillation from indigenous coal, or by fermentation from imported molasses or other carbohydrates. The supply has also been augmented by import of finished products, both natural and synthetic, from hard-currency areas.

The need for the production of petroleum-based chemicals in this country has been fully recognized, and there are now several plants nearing completion. One of the first to start production is the new plant of Shell Chemicals, Ltd., at Stanlow, on the southern bank of the Manchester Ship Canal. Among the most up to date of its kind in the world, the installation represents the culmination of years of research and development; it covers an area of 1,200 acres and employs 4,000 men. The plant itself consists essentially of a thermal "cracker," together with units designed especially to deal with the "cracked" products by fractionation, hydrogenation and polymerization, synthesis and distillation, as well as a number of reactors and convertors. Operation is continuous and, with automatic and highly centralized control, the productivity per worker is expected to be among the highest in any industry in the country.



This impressive photograph shows fractionating towers on the distillation unit of the plant.

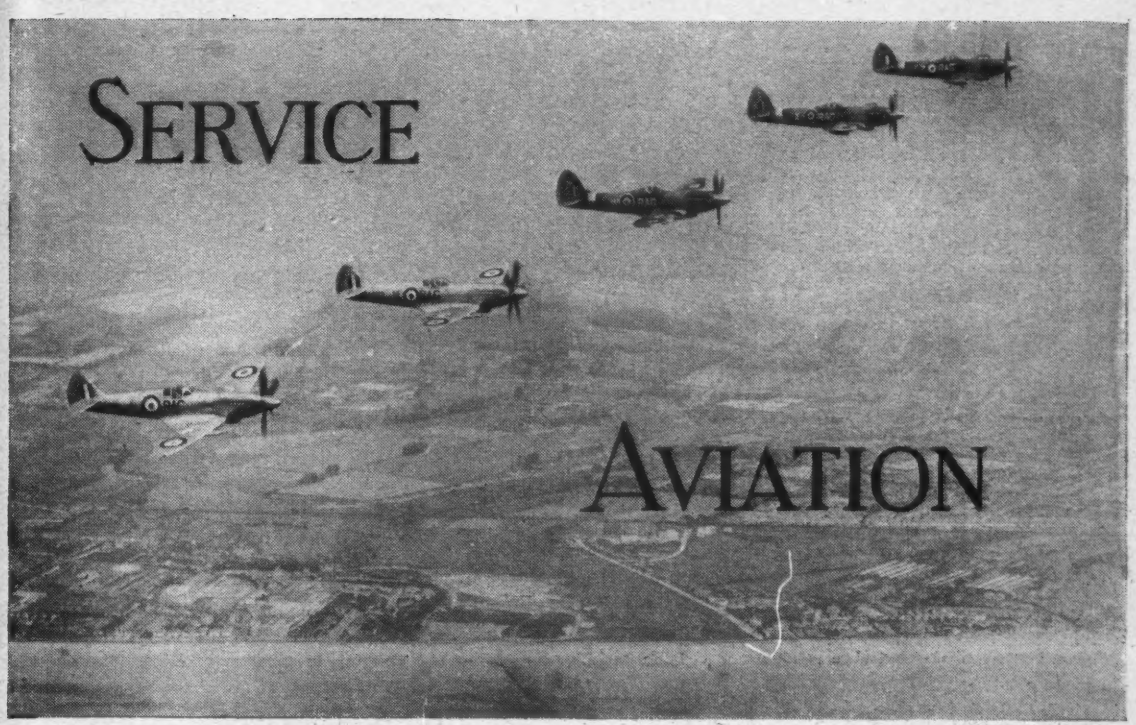


Typifying continuous processing—a view of the cracking plant photographed after dusk.

The basic raw material for the plant is gas oil, which is cracked, under carefully controlled conditions of high temperature and low pressure, to give a high yield of hydrocarbons containing three and four carbon atoms. The new Stanlow refinery, at present under construction alongside the existing plants, is designed to refine 2½ million tons of crude oil a year from non-dollar sources and will, when complete, provide the necessary feed-stocks without the necessity for special cracking. Complete integration of refining operations and chemical manufacture, as already achieved in America, will thus be possible.

Shell chemical engineers, with their almost unrivalled experience in the construction and operation of plants for manufacture of chemicals from petroleum, have brought the complicated and difficult processes of separation and distillation to a very high degree of perfection. This, it is stated, makes possible the production of solvents of minimum 99 per cent purity, the marketing specifications of which are thus of essentially pure organic chemicals.

Incidentally, a most handsome book, *Britain's New Industry—Stanlow*, 1949, designed by F. H. K Henrion, F.S.I.A., with text and illustrations of high quality, has been published by the Shell Petroleum Co., Ltd., on behalf of their associated Chemical Branch at Norman House, Strand, London, W.C.2. A foreword is contributed by Sir Stafford Cripps, who is formally to open the Stanlow plant on July 20th.



"Flight" photograph

IN ECHELON: The near-perfect station-keeping of these Spitfires is an indication of the results of many hours' week-end and annual training by squadrons of the R.Aux.A.F. No. 600 (City of London) Squadron is the unit represented, the photograph having been taken on the occasion of the recent fortnight's camp at Thorney Island.

Plainfare's First Birthday

TO mark a year of non-stop activity, the Dakota which began the Royal Air Force contribution to the Berlin Air Lift on June 28th, 1948, flew again from Wunstorf to Gatow exactly 12 months later. The aircraft, No. 128 of 18 Squadron, was manned by the same N.C.O. crew—Plt. I. Hughes, Nav. II Botsford, and Sig. II Driffill—but the original load of 6,000 lb of flour and bacon was increased by 910 lb, and the cargo carried was newsprint.

Final figures for the *Plainfare* year show that of a total load of 1,952,660 short tons taken into Berlin, the R.A.F. (and the Commonwealth Squadrons) carried 334,227 tons, and the civil operators 123,693. On the lesser-known "back-load" operation—by which cargoes are flown out of Gatow—R.A.F. and Commonwealth aircraft carried 32,809 tons, and the civil fleet 1,602 tons.

The occasion, although a cause for celebration, brought no relaxation in effort: in fact, in the 24 hours ending on June 30th, the R.A.F. achieved a new record tonnage of 2,263.2.

Naval Retirement

THE Admiralty has announced that, with effect from June 22nd, 1949, Admiral Sir Denis W. Boyd, K.C.B., C.B.E., D.S.C., has been placed on the retired list. Early in the war Admiral Boyd commanded H.M.S. *Illustrious*, and from January, 1943, to April, 1945, was Fifth Sea Lord and Chief of Naval Air Equipment. After serving as Flag Officer (Air) in 1946 he became C.-in-C. British Pacific Fleet, and was promoted to full Admiral in 1948.

Royal Air Force and Naval Aviation News and Announcements

R.A.F. Boxing Association

IN succession to G/C. T. N. Coslett, O.B.E., G/C. E. Nelson, D.F.C., of Bomber Command H.Q., has become vice-chairman of the R.A.F. Boxing Association. The Association also has a new honorary secretary, W/C. L. W. V. Jennens, O.B.E., of Yatesbury, who succeeds S/L. J. B. Stapleford.

Victory (Ex-Services) Club

ALL ex-Service personnel—men and women—of the British Commonwealth and Allied Forces are eligible for membership of a recently opened London club which offers such amenities as a welfare, employment, and information bureau, meals at a reasonable cost, accommodation, and games, reading and writing rooms.

Applications for membership of the Victory (ex-Services) Club, which is a logical development of the smaller Veterans Club, should be made to the Secretary at 73-79, Seymour Street, Marble Arch, London, W.2. Fees are 10s per annum or £5 for life. There is as yet no accommodation for married members, however, but if donations are forthcoming it is planned to construct a new building for this purpose on a bombed site near the Club.

President of the Club Fund is Field-Marshal Lord Chetwode.

Coastal Command Entertains

IN return for hospitality extended to members of Coastal Command over the past several years, over 400 guests were invited to the Command H.Q. Garden Party, held at Northwood, Middlesex, last Saturday afternoon. Air Marshal Sir John Baker, K.C.B., M.C., D.F.C., the A.O.C.-in-C., Lady Baker and the members of the officers' mess received the guests, who included Members of Parliament, foreign attachés, and many officers of the Navy, Army, and R.A.F.

Marine-Branch Activities

A 700-ton ex-Naval minesweeper, which now operates with flying-boat squadrons as H.M. Air Force vessel *Bridport*, is making visits this summer to many seaside resorts, as are Sunderlands of Coastal Command. For the operation and servicing of flying boats, target-towing, and maintaining a rescue service for aircraft operating over water, the R.A.F. has its own small fleet, of which the largest vessel is the *Adastral*, a 10,000-ton depot ship for flying boats.

The *Bridport* and its sister ship, the *Bridlington*, are used chiefly as radar target and torpedo recovery ships. There are also a number of high-speed target-towing and rescue craft, and several smaller boats for duties on coastal air gunnery ranges and for the various functions involved in operating and servicing a flying-boat base.

We learn from the Air Ministry that the Marine Branch of the R.A.F., which was formed about 18 months ago to man these vessels, is still short of officers:

Service Aviation . . . . .

applications for appointments to permanent commissions as marine officers are now being invited from officers of the Merchant Navy between the ages of 25 and 33. There are also a few posts available for marine engineer officers up to the age of 51, for which short-service commissions in the initial rank of flight lieutenant are being offered and for which retired naval engineer officers are particularly invited to apply. Applications should be made to Air Ministry (A.R.1), Adastral House, Kingsway, London, W.C.2

R.A.F. Appointment

UNTIL recently Deputy Director of Communications Development at the Ministry of Supply, A. Cdre. C. A. Bell has been appointed Senior Air Staff Officer of No. 90 (Signals) Group. A signals specialist since 1929, A. Cdre. Bell was with the British Air Commission in Washington almost throughout the recent war, first on signals duties and later as Deputy Director of Radio Engineering; he was awarded the Legion of Merit by the President of the U.S.A. in 1943. On his return to England in September, 1945, he went to Bomber Command H.Q. for a year before going to the Ministry of Supply.

"Coastal" for Canada

DUE to visit Canada during July are six Lancasters of Coastal Command, for a four-week goodwill and training mission. To prepare servicing, refuelling and maintenance facilities at Reykjavik, Goose Bay and Greenwood (Nova Scotia), one Lancaster will take off from Leuchars about July 11th, and the other five will leave a week later. The aircraft belong to No. 120 Squadron, which is commanded by S/L. F. A. Pentycross. On their return, during the middle of August, they will fly in loose formation, with each navigator plotting his course independently.

THORNEY POINT: Air mechanics of the visiting Dutch Meteor squadron at Thorney Island time the R.A.F. Meteors from the signal "scramble" to "wheels up."

Reunion

A SECOND reunion dinner has been arranged for all ex-aircrews of No. 202 (Catalina) Squadron on Friday, October 14th, at the Windsor Castle, Wilton Road, Victoria, London. Names and addresses to F/L. T. Snasdell, c/o BM/Catalina, London, W.C.2.

Station Broadcasting

AFTER three months of planning and overcoming technical and production difficulties, officers and airmen at R.A.F. Station, Tengh, near Singapore, have perfected the station's latest amenity, a radio-entertainment system of their own, linking each barrack block on the unit. A room allotted for a studio was redecorated and furnished, and now has the appearance of an ordinary broadcasting studio. Large stocks of records, to suit all tastes, were built up and a comprehensive catalogue produced. Radio Malaya, the civilian broadcasting network in Singapore, loaned out recordings of serials, plays, musical and variety programmes, and the Tengh Broadcasting System has now become very popular on the camp.

There is a team of four announcers, who take duty in turn, each with a programme assistant to manipulate the control panels and assist in the production of the programmes. The programme directors encourage "live" broadcasts, sports talks, quizzes, and personal request programmes. One programme includes records played at the request of relatives in Britain.

The programmes begin with music from 0645 to 0730 hr, are resumed again during the lunch interval, from 1245 to 1330, and continued in the evening from 1800 to 2200.

B.A.F.O. Gliding Team

GROUP CAPTAIN W. B. MURRAY, O.B.E., D.F.C., will captain the team representing B.A.F.O., Germany, at the National Gliding Contests at Great Hucklow from August 21st to 28th. Placed third in last May's B.A.F.O. gliding contests, G/C. Murray is at present the C.O. at Gutersloh.

The other members of the team are F/L. "Jock" Forbes (vice- captain), F/L. P. Mallett, and Sgt. E. W. Basham (reserve). F/L. Forbes, a Spitfire pilot, is stationed at Gutersloh. He won the challenge cup for the best individual performance in the B.A.F.O. contests in 1947 and 1948, and was runner-up this year. During this year's contests he established (subject to confirmation) a new British national height record for multi-seat sailplanes. He holds the British national goal flight record and is one of the three British sailplane pilots to hold the highest international gliding badge, the "Gold C." He took part in last year's International Gliding Contests at Samaden, Switzerland.

Now serving with the air traffic control section at Headquarters, B.A.F.O., F/L. Mallett won the B.A.F.O. challenge cup this year and holds the B.A.F.O. glider endurance record with a flight of 10 hours 10 minutes. He also was in the British team at the Samaden contests. Sgt. E. W. Basham is an instrument repairer, stationed at Luneberg. He was placed fourth in the recent B.A.F.O. contests.

"Flight" photograph

FULL-SCALE AND SMALL-SCALE: At the Northern Heights Model Flying Club's Gala Day, reported last week, an early arrival—flying a Moth Minor from Woodley—was Cdt. Plt. H. W. S. Bethell. He is seen above (back row, in tunic) with brother-cadets from No. 1 I.T.S. Wittering, who have a flourishing model aircraft club, of which S/L. Lord, of that station, is president.

R.A.F. Permanent Commissions

THE following officers have been selected for permanent commissions in the Royal Air Force, in the branches shown:

GENERAL DUTIES BRANCH.

Flight Lieutenants: A. W. S. Bouttell, J. Castagnola, D.S.O., D.F.C., J. G. Claridge, D.F.C., A. E. Lee, G. S. Taylor.

Flying Officers: A. F. Jenkins, P. G. Mallett.

TECHNICAL BRANCH.

Wing Commander: H. H. B. Lewis.

Squadron Leader: J. Mashiter

Flight Lieutenants: L. C. Morris, M.B.E., L. E. Moss, R. B. Stocks.

Flying Officer: F. J. Griffin.

EQUIPMENT BRANCH.

Flight Lieutenants: J. W. Edwards. H. E. Jacobs.

Flying Officer: G. S. Lazell.

Pilot Officer: D. McNichol.

SECRETARIAL BRANCH.

Squadron Leader: G. F. Hales.

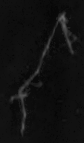
AIRCRAFT CONTROL BRANCH.

Squadron Leader: R. P. Potgieter.

Flight Lieutenants: L. A. J. Patey, C. Sanderson.

Flying Officer: J. G. Cooper.

PROVOST BRANCH.

Flight Lieutenant: G. F. McMahon, D.F.M.

Flying Officer: K. F. Massey.